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SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

EXHAUSTION AS A POWER FOR UNDERGROUND PURPOSES.

The question as to whether working engines by exhaustion for underground purposes is more economical than by compression is one that of late has received a great deal of attention on the part of mining and other engineers. The subject was very fully discussed at the meeting of the Midland Institute of Mining Engineers on Wednesday last, in connection with a paper read by Mr. H. OGDEN, of which the following is a *resume*. Mr. Ogden says—Exhaustion, as a motive-power for vacuum-engines, could not fail if they considered the natural laws of pneumatics. It was certain that the air, as an element clothing the earth, was of different densities, and its density increased in a much greater ratio as they descended a mine than it decreased as they ascended from the earth's surface. The air was also a restless element, always in motion, more or less, throughout all creation. Heated and increased in bulk by the sun's rays, and being again reduced by cold, so much so that in working vacuum engines in a deep shaft there would be from 1 lb. to 2 lbs. pressure at hand to assist them, because the pipe leading from the vacuum engines to the exhausting cylinder at the surface being thoroughly sealed from the influences of the atmosphere, excepting at the extreme ends, a strong natural current at once takes place without the assistance of the exhausting cylinder, the same as a long chimney-stack, by giving the rarified air inside protection from the air outside, and having its extreme ends at a distance from each other, gave an increased draught. By compression a good deal of heat was lost at the compressing cylinder before the air had rendered any service whatever, which was in striking contrast with exhaustion, for the vacuum engines below were using the air at once as fast as it was exhausted, and the engines were working cold, whilst the air delivered by the exhausting cylinder was warm certainly, but nothing like the heat expended in the act of compressing the air—the little heat contained in the air delivered at the exhausting valves might be accounted for by its quick passage through and friction in the pipes connecting the vacuum engines below with the exhaust engines above; therefore, a reverse action took place, though in exhaustion heat was so small as to be easily accounted for. From his experience of exhaustion, he considered it most economical for mining purposes—seeing, its effect being instantaneous, that for mining purposes as was the depth of the mine so was the increased proportional of differential density of the air, which was all in favour of exhaustion, and the denser the air the easier it was to keep up a good workable vacuum. The pressure, it was said, was limited, not often exceeding 14 lbs. to the square inch. Still exhaustion ran parallel to nature, the sun being the great exhauster, whilst compression was entirely opposed to natural laws, and was only producible by considerable waste. It was known that at the sea-level there were about 15 lbs. of atmospheric pressure to the square inch, and the total weight of the atmosphere was equal to nearly 34 ft. of water—whilst barometry taught that the 34 ft. of water was balanced with a height of 5 miles of homogeneous atmosphere; that was, if the atmosphere varied not in density up to 5 miles it would at that height be equal to the weight of water named. On the other hand, there was much that was speculative in judging of the mechanical and electrical conditions of the air, of the different gases composing the atmosphere, and the constantly varying amount of vapour it contained. Mechanism, however, had made such rapid progress during the last 20 years that there were now greatly improved methods for constructing valves, pistons, joints, piping, &c.—whilst the use of machinery in the construction of engines made the latter, when completed, a far superior article to what it was formerly. That fact told most favourably on behalf of the system which he advocated—exhaustion as a motive-power for underground purposes, seeing that the machinery required was capable of considerable improvement. He looked upon an exhausting engine as being a sound power, and one that required the least attention that he knew of, and he was not aware that anything of the description had been practically carried out in the district, or in any other, excepting when himself and his father had engine-works, and made two of the vacuum engines. He had erected one himself, and had seen to the repairs of the colliery. He had seen the working of the engines for a few years, and he assured them that they worked extremely well. Scarcely any heat was set up, save at the two delivery-valves at the exhausting cylinder. The exhausting cylinder, it may be said, is merely the compressing cylinder reversed. Were he using his own means for underground workings, he should adopt the system, by first having his engines fixed, which should be two coupled engines for exhausting purposes at the surface, then fixed vacuum engines at the bottom, and a number of light removable vacuum engines that could be fixed and used directly in any part of the mine. In a sanitary point of view he considered the system was good—for as the air was drawn through the engines out of the workings by the exhauster, the pure and wholesome atmospheric air immediately rushed in to supply the vacuum, and so materially assisted ventilation; whilst, on the other hand, with compression generally at high pressures, the air having lost some of its properties in the act of compression could not be so pure as the ordinary atmosphere. He had seen at the English Copper Company's Works, at Cwm Avon, Tybach, two large exhausters, used for ventilating the works and the shaft generally. It was also known to be a question with many mining engineers as to the desirability of adopting mechanical ventilation to a greater extent than was at present the case, and he ventured to think that if the money spent in the exhausters at Tybach had been expended on a pair of suitable exhausting engines, and worked at a reasonably quick speed, and also a number of vacuum engines judiciously erected in the workings, the result would have gone a long way, not only in ventilating the workings, but also in having a plentiful supply of power at command for every useful purpose required in the pit. That might appear to be too sanguine a view, but it would be found that there was much that could be done in producing power for underground purposes, and, at the same time, materially assisting in the ventilating of mines. Such engines as he had alluded to only required one pipe to be attached for driving, and that only a small one. The subject was one that was in every way worth consideration by the mining engineer in particular, and he suggested to the members of the Institute, in looking at the important question of power for underground purposes, exhaustion as one means to obtain it.

Mr. OGDEN, in the course of a long discussion which followed, said he had seen at a colliery, with a 25-ft. fan, an attempt to force the air down to the bottom of the shaft, and so ventilate the workings, and the result was there was plenty of wind at the top; but there is a difference in density between the bottom and the top, and when they got to the bottom of the mine there was no air. The fan was then reversed for exhaustion, and worked very well.

A cordial vote of thanks was awarded to Mr. Ogden for his valuable paper, which was ordered to be printed in the Transactions.

THE IRONWORKS AND COLLIERIES IN YORKSHIRE.

THE MILTON AND ELSECAR WORKS.

One of the largest private firms in the kingdom engaged in the production of pig and manufactured iron is that of Messrs. W. H. and G. DAWES, whose names are familiar in all the home and foreign markets, and where their brands are in high repute. They are members of a family all well known in connection with our iron and mining industries, and one of whom has recently been brought into prominent notice by his persevering and successful efforts in boring, at an immense cost, to a valuable seam of coal near Halesowen, where such was not expected to be found. The Messrs. Dawes, whose principal works are at Milton and Elsecar, about 12 miles from Sheffield, have in various places a large number of blast-furnaces, including two at Milton, four at Elsecar (two entirely new), three completed, and four in course of construction at Frodingham, in Lincolnshire, and four at Denby, in the Derby district, with a large colliery in connection with the latter. The firm have also several mills, engine-works, foundries, &c.

The Milton Works, which have been worked for a great many years by different firms, are situate at no great distance from Wentworth Woodhouse, the princely residence of Earl Fitzwilliam, the owner of the estate, as well as that of Elsecar, and who is also the proprietor of several extensive ironstone mines and collieries in the neighbourhood. There are two brick open-topped furnaces, both in blast, their height being between 40 and 50 ft., and about 15 ft. at the bosh, each being worked by five tuyeres. The blasting-engine is a condensing one, and the boilers are of the ordinary type. The ironstone used is from the pits of Earl Fitzwilliam and from Frodingham, the two combined making a very good quality of iron, being alike well adapted for mill, forge, or foundry purposes, the rails and plates made from it in particular being in great request.

There are five mills of various sizes in full operation. Two of them are sheet mills, one being a 21-in. train, the other a 14-in. train, a merchant iron mill, a hoop and merchant mill, 9-in. train, and a smaller one, a 7-in. train, for hoops, merchant iron, &c. A high-pressure 60-horse power engine drives two of the mills, and another, of 50-horse power, keeps one of the sheet mills and forge going. There is also a horizantal engine, of 40-horse power, for the second sheet mill, and a smaller one for the forge rolls and squeezer. A 15-horse power engine drives the shears, lathes, and punching machinery, and there is a donkey engine for pumping the water into the boilers, of which there are about a dozen, one being double-tubed, the others of the ordinary type, having evidently been some time in use. In the 14-in. train are rolled merchant and guide iron, as well as hoops or strips. There is also a 5-ton steam-hammer near to the mills. There are 25 puddling furnaces that, unlike those at Elsecar, have undergone no change, and 23 are at work, together with 9 heating furnaces for the mills, 2 softening and 1 balling furnace.

The machine-shop is a very large one, and extensively fitted up with all the necessary apparatus for turning out almost every description of stationary engines. There are a number of lathes, with large planing, drilling, and slotting machines. Adjoining to the shop is that for the blacksmiths, where there are six hearths. The boiler department contains four fires, with punching, bending, and riveting machines, cranes, &c. There are also modelling and other rooms, in which all appeared to be very active indeed. As all the castings required for the varied description of work turned out at the works are made on the premises, there is a well fitted up foundry, with other necessary shops and offices.

The works at Elsecar, distant rather less than a mile from those at Milton, and to which there is a line of rails, have undergone a very great change during the last year or so. Old furnaces have been replaced by new ones, and improved machinery has taken the place of that before in use. Puddling and heating furnaces have been erected, to be worked by gas instead of coal, and gas plant has been put down at a very large expenditure. The works, in fact, have been almost entirely altered, at a cost of many thousands of pounds, and everything has been done calculated to economise fuel and labour, promote health, and to largely increase production and the quality of the material produced.

At Elsecar there are four iron-cased furnaces, two entirely new, and one only just put in blast. The old ones are likely to be altered to the principle on which the new ones are made. The whole of them are about 64 ft. high, and about 12 ft. 6 in. in the bosh. The new ones have several important improvements, are worked by six tuyeres, the gas being taken from the top by pipes for the stoves, but will also be utilised for the boilers. There is a hydraulic lift for conveying the material to the top. A pair of blast-engines are connected with the furnaces, and there are five longitudinal boilers, each about 50 ft. long.

The putting down of Siemens' patent system for heating furnaces, &c., by gas is all but completed, and has just been put into operation, but cannot be said to have got into regular working as yet. About 12 ft. from the surface is a tunnel, with 12 grates set in brickwork, to which the fuel is supplied from the top by means of a hopper, and falling on to a plate fixed at an angle of about 60°. The gas ascends, and is carried to the cooling tube, afterwards to the main flue, and thence to the puddling or heating furnaces. Once the gas has reached the furnace it can be thrown in full force in any direction, or almost at any angle, or increased or lessened as found necessary, there being by the side of the furnaces levers and valves easily worked for those purposes. The system has been found to act remarkably well, keeping up a good and uniform heat when necessary, saving all the labour in firing by the old method, and getting out the heats in much less time. There are six patent double furnaces, worked by mechanical rubble at present completed, and some heating furnaces as well.

Another new machine just put down—and one of the largest made—is that known as While's Patent Blooming Mill, having four pairs of rolls and a reverse crab. The blooms pass successively between different pairs of rolls, arranged one behind the other, the first and third being in a horizontal and the second pair in a vertical position. The rolls are geared together in the usual way, both the vertical and horizontal ones, and so arranged that all the sets of rolls revolve in the same direction. The blooms are brought on a bogey by one man to the leading part of the mill, and after passing continuously between the different pairs of rolls in the course of a few seconds are caught on the other side by a man with a bogey, conveyed to the re-heating furnace, and afterwards to the rail mill. The patent blooming mill is worked by an ordinary beam engine of 120-horse power, but in connection with it a new water-tank has been made, and one of Giffard's patent injectors, together with some of Howard's patent multitubular boilers have been put down. The injector is a rather ornamental piece of machinery to look at, with its pipes, valves, and indicators, but it is also very effective in carrying out the objects it was invented for. By means of the pipes and the other appliances the steam and water enters the Howard boilers simultaneously. There are also other advantages connected with the injector, which will repay the cost of putting down—large though it and the blooming machine must necessarily have been.

In other parts of the works there are two rail mills, an 18-in. train, and a 22-in. train, which will shortly be in full working operation, seeing that the rails of the Messrs Dawes are so well known that there are markets for all that can be produced. There is also a plate mill, a 22-inch train. The mills are worked by an ordinary beam-engine of 120-horse power, there being four vertical boilers, and which are capitally well adapted for raising steam quickly. Near to the mills are the heating furnaces, and there are also about 36 ordinary puddling furnaces in close proximity to the forge. In the forge there are five steam-hammers—one of 5 tons, one of 3 tons, and three smaller ones, worked by a beam-engine and five upright boilers. There are also all the usual appliances required in such extensive works, including locomotive engines, cranes, with a large number of wagons for conveying the ironstone from Lincolnshire. A line of rails from the two works joins the Manchester, Sheffield, and Lincolnshire line, near to Wath, whilst the canal comes up quite close to the Elsecar Works, and by it large quantities of iron and dross are sent away to Hull and other places.

The coal required, as well as some of the stone, is supplied by Earl Fitzwilliam, whose father several years ago entered into a contract to supply the firm with these essentials at the prices which then prevailed, but very different to what they are now. We believe the lease from the Fitzwilliam family of the premises, which were taken at a valuation, was for 27 years, of which about seven years are now unexpired. The value of them at the present time has increased many fold since they were taken to by the Messrs. Dawes. We may say that the managing partner is Mr. George Dawes—a gentleman of great practical experience as an ironmaster, and who has done as much as most men to promote all inventions calculated to lessen human labour, and render the puddling and similar work more healthy than they were. We may also state that there are few places where the educational advantages for children are superior to those at Elsecar and the neighbourhood, whilst the place itself boasts of gas, a covered market, and other advantages.

COLLIERY EXPLOSIONS, AND THEIR PREVENTION.

SIR,—I have read the two letters of "Viewer," commenting on my pamphlet, in the Supplements to the Journal of Nov. 25 and Dec. 9. If he writes again, I trust that he will sign his name, as I do not like to reply to anonymous correspondence.

After some favourable expressions in his first letter, he proceeds to say that my plans "do not seem to be original," and quotes three publications in support of that statement, the first of them in 1819, neither of which have I had the pleasure of reading or knowing anything of; but it will be sufficient to say that the elements of the *whole* of my theory of safe coal mining (except the long wall portion of it) were taught me in the years 1830 to 1836, by one of the first mining engineers of his day, and I have practised them ever since to the best of my ability.

"Viewer" proceeds to say:—

"But the system of Mr. Joseph differs in some important points from any of those mentioned, and no doubt the general features of his scheme are sound; but it would be a great mistake to suppose that by attending to them alone these dire accidents would be prevented; it would, indeed, be an easy task to point out instances where his plans have been followed to a great extent, and yet these works have been visited with the greatest disasters that have ever been recorded.

"The winning and working of the Black Vein, at Risca, in Monmouthshire, were pretty nearly in accordance with Mr. Joseph's views. The coal was worked from near the outcrop, down towards the dip, for many years, and during this time many serious explosions occurred, the last of them being about 1854, perhaps the most awful on record, a very large number of lives being lost."

I wish that he had, before quoting the winning and working of the Black Vein at Risca, in Monmouthshire (which, by the way, does not contain one-half of the fire-damp found in the steam coal collieries of the Merthyr, Aberdare, and Rhondda Valleys), referred to the annual report of Mr. Brough, one of Her Majesty's Inspectors of Mines, for the year 1860, with the plan attached, in which year the great explosion at Risca occurred, involving the loss of 142 lives, and not in 1854, as "Viewer" states. To that report I beg to draw his attention, as I think it will disabuse him of some of the conclusions expressed in his letter.

I may safely say that Risca Colliery was *not* "worked pretty nearly in accordance with my views," but was worked under conditions which I have endeavoured to describe in my paper as being extremely dangerous. The incline plane, although driven down the plane of the seam, having large pillars of coal on each side of it, and there being *four successive horizontal barriers of coal eastwards, to the rise of the place where the explosion occurred*, places the colliery altogether outside the theoretic conditions of safety laid down in my paper, without adding that the Big Vein or Upper Four-feet remained unworked and charged with gas, within about five yards overhead; its gas always disturbing the roof of the Black Vein, and pouring down at every operation of pillar working, thus fearfully increasing the causes of danger.

If "Viewer" is acquainted with the South Wales coal field he wil know, or if he will examine the sections at the end of my paper, h will find that the series of coal seams shown lie very near together besides, the intervening strata are composed chiefly of shales an

underclays full of diagonal cleavages. These form very bad roofs, through containing gas under great tension, when the seams are promiscuously worked, as is too often the case; but when the top seam is worked first, and the other seams in succession downwards, in consequence of the drainage of the gas, the strata "plank," as we call it, that is they settle into tough *dead* roofs upon the underlying seams. The concluding portion of this letter is taken up in the second one.

In the second letter, after some remarks in favour of my mode of working, is the following sentence:—

"The proposal to work the coal all away, and leave no barriers, would bring the system of extensive coal working back to what it was in ancient times. Instead of having properly divided districts, ventilated by separate currents of air, we would have a sort of chaos, without order or system, and, in my opinion, this would be highly dangerous."

And his concluding paragraph is as follows:—

"I remarked above, that the proposal to work the coal all away, without leaving any barriers over the whole of the field, would not be an improvement, but a retrograde step; the proper laying out of the field into suitable panels, or districts, is considered to be the most important matter connected with the working of a fiery colliery, as when this is attended to these districts can be properly ventilated by distinct currents of air, which is considered of the utmost importance in securing the safety of the mine."

To these quotations I submit that there is a complete answer in pp. 22 and 23 of my pamphlet, in the following words:—

"There is no difficulty whatever in a properly ventilated colliery—say, in a colliery where you work 500 tons per day of coal, and pass through about 100,000 cubic feet of air per minute, so to split the main intakes as to give a separate split of fresh air to every body of men not exceeding 100; so to separate the workings into isolated districts by means of successive faces of work, of gob-packing, and the lines of faults, more safely than by leaving any barriers of coal; and so to collect the different splits into the main returns, of which there may be several, and thus obtain all the suggested advantages of the panel system." And again, in pp. 26 and 27, in No. 7 of my recommendations.

Next to working downhill, and working the seams in succession downwards, there is nothing that I attach more importance to than the division of the colliery into independent districts, each containing some 50 or 60 men, and separately ventilated, such districts or panels being completely separated by impassable barriers of gob-packing, or faults, when they happen to lie suitably. This I hold to be better than to leave ribs, or barriers of coal (which are for ever lost, and which cause a great deal of creep), to separate the districts or panels of a colliery.

I do not see anything more in "Viewer's" letters that is not fully answered and explained in my paper, if he will kindly examine it thoroughly, with the sections and diagrams at the end. I beg to add that I can adduce from experience abundant proofs of the correctness of my propositions for safe coal mining in every particular.

Ty Draw, Treherbert, Pontypridd. THOMAS JOSEPH.

OUR COLLIERY LESSORS, LESSEES, AND MANAGERS.

SIR,—The clause in the new Mines Regulation Bill which proposes to throw the *onus probandi* upon the colliery proprietor or manager is not so far wrong, if it is wrong at all, as it would appear at first sight; indeed, it might go a little further, and throw a little on the lessor, thus:—A proprietor of minerals has the privilege of leasing his mineral to any tenant, and he does so: he delegates to the lessee (the coalowner) all the powers that he has, or could have, for a certain number of years. He may work it by machinery, or horses, or men, all that the lessor cares about is that he does not waste the coal, and that it yields him (the lessor) a profit of 6d. or 1s. a ton, as may be agreed on, and that he gets a good annual revenue.

Suppose, then, that two coalowners, both equally able men as far as capital goes, and both likely to give the same annual income to the lessor, and equal in every way so far as the landlord's interests are concerned, but the one is a better engineer than the other. Suppose these two men offer for the same field, and the landlord selects the worst engineer, will anyone tell me that the landlord has not virtually settled whether the field is to be worked at a greater or less loss of life? So much for the lessor, and now for the contractor—the lessee.

The *lessee*, or contractor, having taken in hand to work the coal, and to sell it, so that it shall, at all events, pay the landlord for his pains. Sometimes it is much, sometimes it is little—he has to be content. Now, the lessee decides upon the mode of working, and pays for all the arrangements, and can appoint any man he chooses to carry out and superintend those parts of the operations which he cannot do himself. It is in his power to select the very best manager, or he may select, through ignorance, an indifferent one. Surely very much rests with the lessee.

But supposing him to select the best manager that he can get, and give him all the power necessary for safely carrying on the works; that man is not, like the lessor or lessee, deriving a benefit from the savings, for he is paid a salary. Supposing that the manager, doing all that he can to pay the lessor his rent and the lessee his profit, makes—what all fallible men will do—a mistake, and an Act of Parliament is infringed, should not the persons receiving the benefit of his skill pay the fine?

But descending to the inferior officers, below the manager. Supposing defective ventilation to exist in consequence of their inferior officers' neglect, why should not the manager be held blameable? He has the selecting of the men, both as to number and quality, and it is his duty to preserve discipline. It seems to me, therefore, that there is nothing unreasonable in that part of the Bill which proposes to throw the *onus probandi* on the manager and owners, except that it does not include the lessor.

If in addition to paying fines the same parties were also held liable for damages for the manager's or overman's neglect of duty, it would still further be an improvement, as it would better insure the best system of management. I do not mean to say that the owner is not willing in most instances to do all he can, but it would have a wonderful effect if a mistake told on his *breeches pocket* in addition to the heavy claim already upon it. P. F.

WITH WHAT ARE THE STRATA ABOUT PRODUCTIVE COPPER LODES MINERALISED?

SIR,—It must have been long known to every observant miner that the terms heading this paper ought only to be regarded in a purely conventional sense, and that by mutual tacit understanding and consent they were taken to symbolise and express something wholly different and distinct from what the terms themselves, if ordinarily construed, could possibly import. Mineralisation as applied to metallic minerals denotes a change; change of character and properties by chemical actions resulting in new combinations of metals and metalloids, or metals and the acids, or, further still, metals and the gases, for all gases enter into combinations with the other metals. Waters containing earths or alkalies and but little or none of the metals are said to be mineralised, and very properly so, because the earths and alkalies themselves are minerals. In the same sense the whole of the earth's crust may be said to be and is mineralised; but in what other sense the strata encompassing productive metalliferous veins are mineralised it is difficult to conjecture—at any rate, the mineralisation of the lodes is very different from that of the strata.

In what condition are the metalliferous substances impregnating the earth's crust supposed, or rather known, to be? for we have evidence on the subject—the evidence of science and of sense; are the metallic substances which are diffused through the rocks which produce them found in an aqueous solvent condition, or are they in a mineralised crystallised ore form? What are the proofs, if any, which we have on this subject? It may be interesting and possibly lead to some profitable conclusion if we look into the matter a little. To begin with, it will require no argument to prove that the hardest, as well as all other, rocks are porous, like the animal system, and like it, too, exude both moisture and heat continually, and these are the two great agents universally admitted to be employed in the formations of metallic minerals. Now, the question—what are their separate and united functions to this end?—is one which naturally forces itself upon the attention. An answer to—"What are the functions of water in relation to the formation of metallic minerals?" may be clearly and correctly indicated by a reference to the functions of blood circulating in the animal system, or the sap in the vegetable system. These are analogous conditions of vitality, upon which the constitution and harmony of the three great departments or kingdoms of Nature depend. There is an admitted analogy between the fluids of the animal and of the vegetable kingdoms, in both of which motion or circulation of the fluids is conceded as the primary condition of life. Why, then, deny to the other—and only other—department of Nature undeniably legitimate results of correspondingly analogous circumstances? It can only be conceived to be founded on prejudice, arising from what may have been conventional distinctions, drawn or framed to distinguish between "organic" and so-called "inorganic" nature.

There can be no doubt but that all ores—whatever their character or the character of the veins in which they are found—were communicated thereto from the contiguous and surrounding strata, and that the percolating waters were and are the vehicle of such communications. The question remains, however, in what form the elementary metallic particles exist in their primitive and undeveloped conditions whilst blending as constituent parts of the containing rocks. That the waters convey the metallic substances in solution to the fissures in which they are subsequently found in the form of crystallised and salifiable ores we have proof upon proof, as facts of observation, and which may at any time suitable to ourselves be scientifically demonstrated. How the waters became possessed of these substances and its mineralising power may be fit subjects for conjecture or theory to solve; but I have no hesitation in qualifying the terms as follows—conjecture or theory, enlightened by facts of intelligent observation and experience.

From the solvent power of water and its capacity as a medium or vehicle, it is highly probable that, percolating through every fissure and fibre of rocks comprising the earth's crust, it dissolves and extracts the metallic salts—for in that form I conceive them to be; and then, following a law as organic as that relating to the functions of the blood of the animal system, secretes its treasures in the destined receptacles, and the ores ever forming are subsequently successively formed.

I have not now time to pursue the subject further, but will, with your permission, return to it, probably next week. R. KNAPP.

Elsworth, Nye County, Nevada, Nov. 15.

DUNLOP'S PATENT INDEX.

SIR,—I wish to bring under your notice a most remarkable coincidence. A friend called on me this morning stating that in the *Mining Journal* of Nov. 25, page 1054, I should find a comment upon my "Index," or "Letter Assorter." I was somewhat astonished, as not having yet published it I was satisfied it could hardly refer to my invention, and upon reading the paragraph I was confirmed in my impression; but, at the same time, my curiosity and surprise were not diminished, as from the description of "Dunlop's Patent Index" given in your columns I conceived that the same idea, although in a somewhat different form, but apparently for the same purpose, had occurred to two persons about the same time, and of the same name; and very likely it will turn out that those two persons are total strangers to each other.

I may as well here state the description and uses of my "Letter Assorter," or "Index." It consists of a backboard; arranged upon it are 31, more or less, pieces of cardboard, tin-plate, or other suitable material; these pieces of cardboard are lettered from one upwards, and also with the alphabet, and the months; each card overlaps each other, so that the letters, figures, &c., can be all seen at a glance, arranged in the same manner, in fact, as my "Calculator" (the original source of the idea in my case), the dimensions of the whole thing being about 3 ft. by 2 in. by ½ in. Its uses are as follows:—1. To assort papers according to date, alphabet, numbers, name, &c—2. To file away letters and papers for reference, instead of a set of pigeon-holes.—3. (and this the most useful). To keep upon the writing desk or table papers in complete classified order, being altogether, and yet each subject quite complete, and in such a manner that no hunting for a paper is at all necessary. The papers are not folded up, but merely slipped in their respective openings, with the edges exposed to view; in this manner any reasonable number of papers (say 3000) can be kept classified under 31 or more different heads. Three of these assorters form a set—*i.e.*, one each for past, present, and future reference, and one additional for printed forms. Being so formed it is portable, and there is an arrangement for securing the papers when not in use, so that the whole may be put away in a drawer or box, or hung upon a peg, without any fear of displacement.

If you will oblige me, I shall be glad to see this letter in the Journal.

R. DUNLOP,
Inventor of Calculating Machines. Honourable Mention, Paris Exhibition, 1867.

Cwm Avon Works, Port Talbot, Dec. 5.

MINERAL RESOURCES OF IRELAND.

SIR,—I was gratified to see the article on the "Mineral Resources of Ireland," in the Supplement to the *Mining Journal* of Dec. 2. It is very true minerals largely abound on the south and west coasts of Ireland, and hitherto have been greatly neglected. I quite concur in many of the remarks the writer of that article sets forth, until he begins to pourtray the mineral resources of the "Curraune" estate, in the county Mayo, an estate I have been long acquainted with, and can state some facts relative to it which I think should be made known, and then leave the investing public to form their own judgment before embarking in that enterprise. It is well known that the Curraune estate has been in the market some years; there is a mortgage upon it of 12,000*l.*, with arrears of interest; the receiver of the rents still claims 3400*l.* for those arrears. The mortgagees have now placed the estate in the Landed Estate Court, in Dublin, and should a sale take place in that court it is very doubtful if a price would be bid to cover the mortgage and interest. The wisest policy, of course, is to wait the sale, and not give a large speculative price for the estate, far above its worth.

Mr. Spargo's report and map of the estate, showing the mineral lodes, are of old date. I know for a fact that a competent party, who visited the estate this last summer, with the intention of purchasing it and working its minerals and ores, could not gain access to any one mineral lode laid down in Mr. Spargo's map. All shafts choked with debris; hematite iron ore nowhere to be seen but in a few straggling stones on the shores. The seaweed on the 12 miles of coast in the bay only fit for manure; 100 tons of marketable kelp could not be made per annum. The isolated position of the bay preventing the large seaweeds suitable for kelp-making floating in from the gulf stream, where it is largely deposited on the shores facing the Atlantic. The result of that gentleman's visit to Curraune was to abandon it as a commercial enterprise, leaving it to others to embark capital in it if they should think it can be made a paying concern.

The figure now spoken of to be given for the purchase of the Curraune estate exceeds belief—20,000*l.*—and of this I understand 2000*l.* goes into the pocket as commission to the party who introduced it to the promoters of an intended company. My object in giving this information is solely with the view of promoting the development of the mineral resources of Ireland, by candid and reliable statements, which can be verified upon investigation, avoiding all highly-coloured particulars to excite attention. VERAX.

MINING IN NORTH WALES.

SIR,—Seeing, in the Supplement to the Journal of Dec. 2, some Notes on Mining in North Wales, and, amongst several other remarks, an account is given of an excellent discovery by some poor men, who, from circumstances therein explained, were driven to explore a piece of what may be called virgin ground, and made a very important discovery. Being an old miner, and of course feeling interested in all mining pursuits, I felt anxious, having a little time on my hands, and being somewhat curious and, perhaps, sceptical in my notions, I thought I would go and see for myself if what was stated were true. On arriving at the spot I found the mine was situated on a hill, and on every side surrounded by the greatest dividend mines in North Wales. On the south the well-known Belgrave, which has given in dividends 900,000*l.*; to the north, Pant-Du, 850,000*l.*; to the east, the Llanarmon Mine, 800,000*l.*; and to the west the Maes-y-Safn Mine, which has given 300,000*l.* This piece of land, containing several parallel lodes, is in the centre of the lot. It had been previously noticed by the ancients, as they had worked on several of them on the backs for scores of yards in length, and in one place some 40 yards in depth. While thus surveying the surface I was joined by some of the interested parties, whom I had not the least acquaintance with, and had a very cordial invitation to go down, and see the lode they had discovered. The temptation was too great for me to resist, and, being supplied by one of the party with some underground clothes, we descended the pit. But to describe the footway is too much for my nerves now, with the rotten ladder-steps, the scrambling down two winzes nearly perpendicular by an old chain, then dragging myself scores of yards on my belly through the old men's workings, and I was glad indeed when I got to the end of my journey, where I was agreeably surprised to see a large pile of lead, some lumps over a ½ cwt. already broken, and a lode several yards long in new ground, which I thought would produce over 3 tons per fathom. On further examination I found this lode to be worked upon about 35 yards from surface for a considerable length, and from which a great deal of ore had been raised. There are other lodes seen at this and upper levels, which I had not time to explore—suffice it to say, the discovery and mine altogether is one of more than ordinary promise, and I am glad for the poor men, and hope they will realise the rich reward their courage has justly entitled them to. AN OLD MINER.

IRON ORES IN CORNWALL.

SIR,—I hope you will permit me to say that there need not be any anxiety in the minds of Bessemer steel manufacturers as to a sufficient supply of iron ores from the British Isles suitable for their requirements.

As Chairman of the Cornwall and Devon Iron Mines Corporation, I am in a position to assure them that the Great Perran lode of Spathose iron in Cornwall has been opened, and proved to such an extent as to show that the quality which can be obtained by simply quarrying rather than mining is practically unlimited.

Independently of this, the great lode of red hematite ore which intersects at right angles the tunnel on the Newquay Mineral Railway is one already proved to be abundantly rich.

The company to which I have referred (and whose capital has been subscribed for privately) has secured extensive grants some miles in length on the above lodes. These lodes are immediately contiguous to the railways. The opinion which has heretofore been expressed as to the quality of Cornwall iron ores has been formed from comparatively surface workings. Bessemer steel manufacturers will, however, be better able to judge of the capabilities of Cornwall ores from the following analyses, one of the spathose ore, and the other of the red haematite about to be worked:—

ANALYSIS OF SPATHIC ORE BY DR. NOAD.

Analysis from Ore at Quarry.		Ore in Depth.	
Carbonate of Iron	74·11	Water	12·00
Peroxide of Iron	2·00	Peroxide of Iron	85·55
Carbonate of manganese	6·73	Oxide of manganese	0·80
,, lime	1·50	,, lime	None.
,, magnesia	7·80	,, sulphur	None.
,, sulphur	None.	,, magnesia	None.
,, phosphorus	None.	,, phosphoric acid	Trace.
,, silica	8·00	,, silica	1·20
Lost by roasting	28·00	Metallic iron	60·1
Iron in roasted ore	50·00		

ANALYSIS OF RED HEMATITE ORE BY DR. HILL.

Peroxide of Iron	73·21
Silica	3·12
Phosphoric acid	Trace.
Sulphuric acid	Trace.
Metallic Iron	51·25

The questions for Bessemer steel manufacturers are:—1, quality; 2, quantity; 3, price; 4, facilities of shipment.

The quality is shown by the above analyses.

The quantity is practically unlimited.

The price will be below that now paid in the Ulverstone district and elsewhere for ores of a similar character.

Facilities of shipment insuring a continuous supply will be secured by the completion of a system of railways under arrangement with the Cornwall and Devon Iron Mines Corporation, who are engaged in extending the harbour accommodation at Newquay on the north coast, and at Par and Fowey on the south coast of Cornwall, the latter harbour admitting ships of upwards of 1000 tons burden to load at all times of the tide.

I will only add that the suitability of these ores for the manufacture of steel is shown by the evidence of Mr. Bessemer himself given before a parliamentary committee, to the effect that it would be of the utmost importance and advantage to the leading iron manufacturers of the kingdom to have the Perran iron ores thoroughly developed as those ores were specially adapted for the process of steel making. ROBERT MONTAGU.

The Cornwall and Devon Iron Mines Corporation, 31, Essex-street, Strand.

SPAIN—PRESENT, PAST, AND FUTURE—No. III.

SIR,—Having procured mules and a guide from Almaden, we proceeded to visit the lead and silver mines of St. Euphemia, worked by a Lisbon company, employing some 200 hands, and turning out from 40 to 50 tons of metal per month, an output which, with capital and improved machinery, could easily be quadrupled. With the exception of a steam-engine got from England for driving the blast into the furnaces, the machinery was of the rudest description. For instance, the water required to be supplied to the cisterns for all kinds of work, instead of being brought from the hill above by a pipe, which could be done at a trifling outlay, was carried in earthen jars on the heads of stalwart Spanish women.

The smelting-pots or furnaces, which are of native manufacture, are of the simplest construction. They are formed of a red tenacious clay found on the spot, and are hooped with iron. They turn out about 1½ ton each per day. At first they cost about 3*l.*, and if broken the earthen part can be replaced at a cost of 1*l.*

The smelted metal as produced at the mines, being lead and silver combined, brings in London about 18*l.* or 19*l.* per ton for the lead alone. To this is added about 25 per cent. per ton for the silver. At the time of my visit this company had no de-silvering works, but were about to erect them. Pure desilvered lead could be sold in Lisbon for transport to Brazil at 22*l.* a ton.

I found these mines to consist chiefly of carbonates and sulphurets of lead. It is expected on going deeper, however, to find galena. Here I found those huge mountains of debris left by the Romans, spoken of in my last paper, and I was amazed to see many hundreds of shafts sunk by them as perfect as when first formed 2000 years ago. When these are cleared out, and they can be so with little difficulty, the galleries are at once approachable. These shafts vary in depth from 40 ft. to 60 ft.; the ancients being unacquainted with the laws of ventilation were unable to penetrate any deeper. The lodes of ore lying at about an angle of 45° right through the hills get richer as you go deeper, therefore I think, as with the quicksilver of Almaden, there is more to be taken out by good engineering than has ever yet been extracted. There is a splendid new military road which has recently been made by the Spanish Government between Madrid and Cordova, which passes close by the smelting works. It is worthy of mentioning that this road, for 2 or 3 miles, has been almost entirely formed of the ancient Roman debris of lead and silver; a proof of my former observation as to the inertness and supineness of the higher classes of landed proprietors, and of their ignorance of the importance of these remains. The value of these, as stated formerly, has been found by accurate analysis to be 26 ozs. of silver and 32 per cent. of lead per ton. I am told by experts that 3 ozs. of silver per ton extracted from such remains would give a very great return, by the new and improved methods of desilvering, seeing it requires no quarrying, &c.

We spent a few very pleasant days here, visiting the neighbouring places, and admiring the beautiful scenery of the Morena. We were most kindly and hospitably entertained by the managers. Mounting our mules again, we left in early morning on our return to the station of Almaden, on our way to Cabeza del Buey, to visit a second group of mines, named Santa Maria and Costello, which we had been informed were even richer than those which we had just visited. These mines are situated to the east of Cabeza del Buey, at a distance of about 4 miles from the station. Geologically speaking, the Sierra Morena is, perhaps, the most ancient of the mountains of Spain, if we classify them according to their period of elevation; for on both sides the tertiary strata in contact with the old rocks are horizontal. The prevailing rock is a Silurian slate, intersected with greenstone

and trap; the mountains of the Sierra Morena running nearly from north-west to south-east.

We found these mines almost at the western extremity of the great valley called the Serena, formed by two ridges of the mountain running almost parallel; and, as had been represented to us, we found the ore of a very superior character, consisting almost of pure galena, intersected by veins of copper. The champion lode of the Santa Maria Mine is nearly 12 ft. thick. In an adjoining mine, called Costello, and others belonging to the same group, there are shown rich lodes of galena or sulphate of lead, 6 ft. in thickness. We were told that the ore produced from 60 to 75 per cent. of lead per ton, and from 16 to 25 ozs. of silver to the ton of manufactured metal. We understand that these mines belong to private parties, who reside in Lisbon. These parties, we were told, were contemplating the extension of the number of shareholders by inviting English capitalists to invest in the concern. They only require money and energy to develope the immense wealth which is lying buried in these mines.

About 30 miles to the south lies the great coal field of Belmez, on the line of railway from Almorchon to Cordova. The nearness of coal is of course of great importance to all the mines in that district of the Morena. Proceeding from Cordova by Granada down to Malaga, in the southern extremity of the peninsula, we find in the Sierra Nevada large deposits of silver, lead, copper pyrites, iron, &c. The mines of copper pyrites in this neighbourhood have yielded an immense fortune to an enterprising Englishman, and we observe an English company has lately been brought out to work the lead and silver mines near Malaga, which are understood to be exceedingly rich and valuable.

I have already occupied enough of your space with these jottings, and, meagre as they are, they are sufficient to show the amazing richness of the Peninsula in mineral wealth. I have travelled from north to south, and everywhere find the same story—immense deposits of mineral wealth, waiting capital, and energy, and skill to develope them. TRAVELLER.

MINING ON THE RHINE—GERMANY—No. XII.

MENZENBERG MINING COMPANY (LIMITED).

SIR,—The *Mining Journal* of April 9, 1870, contained a notice of this mine, which comprises two concessions, comprehending together over 800,000 square lachters, and having a run on the course of the north and south copper lodes exceeding 1000 lachters, with about an equal length east and west on the silver-lead and blende lodes. All the lodes of the celebrated and rich mines of St. Josephsberg and Marienberg pass through the sett, or concession, for its entire length north and south, and other very large lodes, not before discovered in this district, have been opened on recently in this property. The Government surveyors, at and before the grant of the first concession, had laid down five distinct lodes as known and seen within its limits; and toller and chief inspector Freiherr von Hüne, in his report to the Prussian Government, stated that he had measured one of these lodes in an adit level then open, and had found it to be 27 ft. wide, the lode at that place being composed of spar, with stones of carbonate, malachite, phosphate, and strings of yellow and grey sulphuret, and nests of red and black oxide of copper ore. This lode was again cut at surface, about 10 lachters further north, equally large, and of similar composition. In a small shaft near to the northern boundary of St. Josephsberg, at the depth of 10 lachters, by means of a cross-cut driven east, two lodes have been intersected, one 18 in. wide, and the other 9 ft., each composed of spar, but containing little ore—only spots in the spar. These will form a junction at a depth of about 15 lachters, or 5 lachters under the present level; and as the larger lode is embedded in a dark-blue killas, and has a flookan of about 2 ft. wide, it is expected that lead will be met with. In a deep trial adit two large lodes have been discovered, one carrying a considerable quantity of manganese, with spots of copper; this lode is about 5 feet wide.

The great feature of the concession is a lode discovered in a shaft intended to intersect a very large lode at 25 lachters deep, but at 2 to 3 ft. under surface a lode of rich copper ore was discovered, in which the shaft has been sunk 22 ft.; the lode is composed of spar, with carbonate of copper, phosphate, malachite, black and red oxide, and yellow and grey sulphuret of copper. This lode has improved in quality in sinking, and will now yield about 15 tons of ore to the fathom, one-half being of a produce of 4 to 5 per cent., which will be reduced in the laugerie by the acid process, now generally in use in Germany; and the other moiety, being from 12 to 15 per cent. ores, will be sold in the usual way to the smelters. The bottom of the shaft is valued at from 90*l.* to 100*l.* per fathom, and there is not less than 50 tons of ore at surface, the cost of raising which has not exceeded 25*l.*, including the timbering. The shaft, which is 9 ft. by 4 ft., is in a course of ore. Of the size of the lode no judgment can as yet be formed, nor of the value per fathom, the estimate of 90*l.* to 100*l.* being *only for the size of the shaft, which is, as stated, 9 ft. by 4 ft.* The direction, the underlie, and the width are unknown. This lode is admitted by the numerous agents who have inspected it to be the finest lode seen at the same depth in this rich district within the memory of man, a district comprising the mines of Marienberg and St. Josephsberg. Nor must the important facts be lost sight of that the present workings are within a mile and a-half of the Rhine, within one mile of the railway station at Honnef, that timber is cheap and abundant; also, that labour is cheap, that these freehold concessions are held direct from the Government, in perpetuity, at a royalty, or dues, of 1-50th, or 2 per cent. on the produce only.

Dec. 13. OUR CORRESPONDENT.

MINING PROSPECTS OF UTAH, AND THE UTAH SILVER MINING COMPANY, BINGHAM.

SIR,—From the very large amount of English capital being invested in mining enterprises in this western country, I have felt that a few items on the subject might be of interest to your mining public, to which end I now forward the subjoined, trusting you will be pleased to give it space in the columns of the Journal.

From the early part of the spring of 1870, when mining began to be entered upon in Utah with any degree of energy, to the present, the advance made in the development of the mines then and subsequently discovered, as well as in prospecting for and locating additional mining districts, building reduction works, increasing amount of shipments of both ore and bullion abroad, stands unequalled in the history of the early development of any mineral country yet discovered for a like period.

In the summer of 1870 there were located in Utah seven mining districts, known to contain valuable and precious metals, while at this date that number has been increased to 48, with discoveries still going on. At that period the number of mines worked practically was 22; to-day over 800 mines are under substantial development. Then there were eight paying mines, yielding to the locators an income from each of $4000 per month, with twelve others giving a monthly profit of $1000 and upwards, while the Emma at that time paid a net monthly profit of $20,000; now there are ten mines in the Territory which pay monthly a profit of $20,000 each; 50 mines paying over $3000 monthly; 100 mines paying over $1000 monthly; while the Emma is now, and has been for the past nine months, averaging fully $250,000 per month gross. The Flagstaff exceeds $45,000 per month, with about 300 other mines, the ores of which, not being reduced or shipped abroad, are accumulating at the mines ore to the value each month of from $1000 to $5000 each. At the time named there was one efficient but small furnace in the Territory; to-day there are 19 well-constructed blast-furnaces, with an average capacity of 15 tons each daily, besides six others in course of construction, with three quartz mills complete, and two in course of construction, and three sampling works. The bullion product in the same time being increased from a few small sample lots to regular monthly shipments of from 1400 to 1500 tons, of the gross value of $360,000, with an increase in the value of the ore shipments of from about $30,000 to $275,000 monthly. Add to this the advance made in the opening of the coal fields of the country, as well as in the utilization of the very superior grades of iron ore, by its manufacture into pig-iron for local purposes in the southern part of the Territory, with the rapid strides making in the construction of the Utah Southern Railroad, when, all combined, will present a more rapid rate of progression than is to be met with in any part of the mining world. It certainly is a fortunate circumstance for the future prosperity of mining in Utah that so many of your leading mining men (who, in fact, are the leaders of that industry all over the world) are turning their attention to the unequalled advantages of this Territory for mining projects, who, with their ample means, sound, thorough, and truly practical knowledge of mining and metallurgy, their slow but sure methodical system of prosecuting this business, cannot fail to ensure undoubted success to what they undertake in Utah, provided always that sufficient caution is exercised in the selection of property, and that none is accepted of but such as is first-class.

Should the same care be taken in the future as that used in the past in the choice of property, and should investors be equally as fortunate in their agents and experts sent here to examine and report on mines presented in your market, then, indeed, will there be but little apprehension for a successful result. With such mining property in the hands of English capitalists as they have been purchasing of late in this place, such as the McConnell and Skiffington property in East Canon, the Sparrow Hawk, and others, sold of late by Col. E. H. Shaw to the Camp Floyd Mining and Milling Company (Limited), of London; the Saturn Mines, purchased by Capt. Fowler for his company; the Yosemite, and No You Don't, with other mines in Bingham, purchased by Mr. H. Sewell for his friends in London; and last, but amonst the most prominent of all, the property of the Utah Silver Mining Company (Limited), also in Bingham Canon, there can be no such word as fail, unless by the most stupid of blundering, and reckless disregard of the necessary appliances and qualified skill to meet any chance or emergency possible to arise in the conducting of such enterprises.

I notice in the Supplement to the Journal of Oct. 28 considerable controversy, with much bitter criticism, passing between certain parties, who evidently are deeply interested on your side of the water, and Mr. H. Sewell, agent for the Pacific Mining Company, of Austin, Nevada, on this, in regard to certain statements made by a Mr. H. Altman, and other correspondents of the Journal, relative to the property of the Utah Company, in Bingham. While a friend to the Utah Company could well afford to let the criminative squibs of "A. D.," "Scrutator," "A Shareholder," "One Interested," and H. Altman pass for their illiberal misconstruction of the whole intent of Mr. Sewell's correspondence, well knowing that the property of the company at Bingham needs no bolstering from gentlemen so very sensitive to the touch, and yet so dull of comprehension. Happening, however, to be conversant with most, if not all, of the facts of the case, I thought, in the absence of Mr. H. Sewell, I would endeavour to somewhat qualify some of the statements made, which evidently have been dictated under serious misapprehension. Mr. Altman's second letter so very handsomely qualifies many of the statements made in the first, that he certainly should be entitled to an aquittal in the case, were it not for his allusion to a something which he calls "other motives" and "private grievances of Mr. Sewell with the Utah Company," as well as his criticism on Mr. Sewell's admission of the new furnace's capacity being of 70 tons daily, which, with the old one, would bring in such an income as would make Mr. Sewell appear to be bearing out the statements of Mr. Altman relative to the value of the property, &c. To the first two charges, of "other motives and private grievances," I can have but little to say, and being a comparative stranger to the parties concerned cannot presume to know what difficulties may have heretofore existed between them; but this I do know, from repeated conversations with Mr. Sewell on the subject, and the very great interest evinced by that gentleman in the company's welfare at all times, that he can be no other than a most sincere friend to the company, so far as their operations extend at least. To the second of Mr. Altman's charges, which in a measure cannot fail to explain away the first, I claim to be able to speak from the "book." Mr. Altman certainly cannot claim to be so very obtuse as not to understand Mr. Sewell's intent by inference, when he complained of want of capital, and suggested further reduction-works, that Mr. Sewell intended the increase of capital to open the mines so as to furnish sufficient ore to supply the increase of reduction capacity equal to the promised annual profit of 100,000*l.*, as held out to shareholders by the promoters of the enterprise. It was with a view to the fulfilment of the promoters' pledge of annual profits that Mr. Sewell, so well understanding the situation, went into figures at once, to show what was necessary to be done in the premises to that end. Having computed the net earnings of the old furnace, based on the results obtained under the old management, and placing it at 15,000*l.* per annum, Mr. Sewell at once saw that no less than seven additional furnaces of the old style, or four of the new, of a capacity each of 45 to 50 tons daily (not 70, as mistated, which was meant by Mr. Sewell as the capacity of old and new furnaces combined), would suffice to produce the result so anxiously to be looked for. This reducing capacity would, on the one-furnace basis, give 20,000*l.* more per annum apparently than the reality will admit of, as a vast difference is certain to occur in the percentage of the metals in the ore when extracted, handled, and reduced in the large way over that of the small, making at least a difference of one-sixth, which would thus bring the reducing power only equal to the necessity of the case. Now, then, can any sane man claim not to understand the point of Mr. Sewell's recommendation for the placing of further working capital in the hands of the management here, when it was so well known to Mr. Sewell, as it must be to Mr. Altman, who had the advantage of "close and critical inspection personally on two occasions," as he himself admits, that no advance work was done on the property at all adequate to the extraction of any such amount of ore as the above capacity and figures would require, there being, in fact, not much more than sufficient development on the property to afford a continuous supply for the old furnace? Hence Mr. Sewell's anxiety in the matter, and hence the injustice done him by his critics in not understanding his motives, by attributing to "feelings," &c., inimical to the Utah Company, what has been solely prompted by his better judgment, to secure to that company in the only way possible the full benefit as calculated on from their invaluable possessions in Bingham Canon. Mr. Altman's figures and computations are all well in their way, but how is he to realise all this without first opening the mines, and this, too, on a very large scale, so as to keep up the supply? Although the game may be in view, you must first bring it down before you can cook it, all of which costs ammunition and time—hence Mr. Sewell's oft-repeated demand, or rather advice, to raise sufficient capital.

"A. D." charges Mr. Sewell with a failure of his duty, in not embodying in his report made as referee the suggestion thereafter made in a private letter to one of the directors, regarding inadequacy of the working capital of the company; but when his position in the matter is rightly understood, being but that of umpire, to determine on the merits of the company's mines as between Capt. J. Nancarrow and Mr. H. Janin, he certainly would appear as intruding his good offices on the directors of the company had he done more than perform the duty for which he was called on at the time. "Scrutator" comes next. He does not say much; he delivers his fire, short, sharp, and decisive. His horn of the dilemma is Mr. Sewell's admission that "present new and old furnace would produce equal to 80 per cent. profit per annum," while he overlooks Mr. Sewell's full intent of opening the mines so as to procure the ore, as already explained. "Scrutator" waxes independent, "preferring to rest on present satisfactory results" to "noticing Mr. Sewell's criticism," as he calls that gentleman's practical suggestions. If he is, as he claims to be, content with present results, then indeed must his ambition be of the very mediocre sort, unless that his design should be to have the Bingham Mines of the company preserved unexhausted for the benefit of generations yet unborn.

"A Shareholder" gives the unkindest cut of all, when, after going over the same ground as that already answered, he "presumes Mr. Sewell, in recommending a metallurgist at the works, to have meant himself" (Sewell). This does Mr. Sewell much injustice, which, from my personal knowledge of the facts, I cannot allow to pass unnoticed. Mr. Sewell did not then, or at any other time, mean himself in that capacity, but he did mean the writer of this article, who had been in charge of the works of the old company, when he, in common with the company's agent (Capt. Nancarrow) and Mr. Bateman (one of the promoters), desired to secure a continuation of my services at the works, having been remarkably successful at all times in the reduction of the ores, producing daily from 5 to 6½ tons of bullion from the old furnace, but which for certain reasons I was obliged although somewhat reluctantly, to decline. This, then, is the individual, and not "himself," Mr. Sewell had in his mind's eye when he made the suggestion in his letter to which "A Shareholder" so sarcastically refers. Next comes "One Interested," charging Mr. Sewell with misrepresentation, &c., inasmuch as the directors and secretary, one and all, deny the receipt of the private letter from Mr. Sewell relative to increase of capital, &c. I well remember Mr. Sewell reading the particular passage to me before mailing the letter, and the press copy was in Mr. Sewell's possession when last I met him, and likely is still there, and will be forthcoming. The next complaint, and one on which great stress is laid, as "showing the animus of his entire communication," as your correspondent has it, is in Mr. Sewell styling Mr. P. A. Eagle secretary. Mr. Eagle signs himself "resident secretary," is advertised as such, and what more natural than for people here to call the gentleman by the title conferred on him by his employers and position—small matter, indeed, to rush into print about. As to the charge of being a "disappointed man," and in consequence entertaining ill-will toward the company, being fully explained above I must now dismiss. It never having been in the scope of his ambition, he cannot possibly be the disappointed man these gentlemen, one and all, would make him appear.

Being in possession of much to enlighten the mining public on this and kindred subjects pertinent to the Utah Silver Mining Company's operations, and not being the "disappointed man" myself, I shall in my next drop some facts which will furnish subject matter in abundance for these gentlemen to reply to and criticise.

Salt Lake City, Utah Territory, Nov. 24. JOHN R. MURPHY.

THE UTAH SILVER MINING COMPANY.

SIR,—I see one error in my letter on the Utah Silver Company—That the capacity of the big furnace is stated to be 70 tons, whereas it should be 40, or double the size of the old one. H. SEWELL.

Salt Lake City, Nov. 24.

EBERHARDT AND AURORA COMPANY.

SIR,—As I am neither "bull" or "bear" of this stock, perhaps you will give space to the following extracts from my agent's letter from this district.—*Palmerston-buildings, London.* H. H. ROCHE.

Treasure City, Nevada, Nov. 15.—Yours of Oct. 21st at hand, and contents noted. I have to thank you for the prompt answer giving me the state of the London market, as it enabled me to take advantage of the market here, so as to dispose of the Nutmeg and El Capitan Mines for $90,000. I think that English capitalists are the purchasers, through an agent. The fall in the Eberhardt is unfortunate and causeless; if the property was ever worth 40*l.* per share it is worth it now. I have just examined their mines, in common with all the active mines in the district, for the purpose of collecting statistics for the forthcoming annual report of the U.S. Commissioner of Mines; and will here mention a few facts that may be of interest to you. The quantity of good milling ore exposed in the Ladies' Chamber cannot be less than 20,000 tons, in other parts of the Ward Beecher (say) 5000 tons, and in the Risdale Chamber of the North Aurora, about 15,000 tons, or 40,000 tons in all; we will put the average of that at $40 per ton (which is considerably less than the average of that worked for the past year), and we have a gross value in sight of $1,600,000. The expense of extracting from the mine and reducing to bullion ought not to exceed $20 per ton; thus we find a clear profit on the ore in sight of $800,000. The quantity of ore extracted and worked from the Ward Beecher alone, since Sept. 30, 1870, is 11,157 tons, which gave a gross yield of $457,223·64; 1331 tons of this was extracted before the mine became the property of the Eberhardt and Aurora Company.

THE EBERHARDT AND AURORA MINES, NEVADA.

SIR,—As it was intimated in a letter published in the Supplement to last week's Journal that because I ridiculed the idea of comparing a mine of Virginia city with the Eberhardt or any other White Pine mine I did not understand my subject, I beg to say the writer of that article is quite right in saying "mines are governed by geological formation, not distances," and the geological formation of Treasure Hill is very different from that of the mines and mining country at and about Virginia city. I have seen no statements of the Eberhardt Company as to cost of mining, hauling, and milling, and, although the company would publish perfectly truthful statements as to cost, I still say that it has not been done for $16 per ton. It is a year since the tramway was commenced, and to the present time it has been only an expense to the company, so what may be done in the way of cheaper transportation of the ore from the mines to the mill we shall hereafter see.

It was a matter of astonishment to the business men of Nevada, who were well acquainted with White Pine, when the operations of the Eberhard Company were commenced and carried out on such a grand scale, for this company took hold of their work after men of great mining experience, and with an abundance of capital at their disposal, had abandoned the district. All about were evidences of failure. The towns of Hamilton and Treasure city, from being overcrowded, became, at least so far as Treasure city is concerned, almost deserted; hundreds of mining companies were formed in San Francisco, and the money raised by them was spent on and near Treasure Hill. The gentlemen who originated the Chloride Flat Company were amongst the most experienced and wealthiest men of the Pacific Coast. The company had a capital of 50,000 shares, which sold for a time in the San Francisco market at $25 to $30 per share, equal to 200,000*l.* After working and assessing the stock until assessments could not be collected the company wound-up, sold their two complete mills for about 12,000*l.*, and the Chloride Flat Mines for about 2000*l.* All this is history, and anyone can learn, as many have done, the facts from most reliable parties, in both Nevada and California.

With these facts before the parties interested—they are about to purchase waterworks (I see by reports of their meeting), and pay 30,000*l.* I have been told that the Bank of California had a judgment against these waterworks, and that they were bought in for about 10,000*l.* at a time when the population requiring water was 50 per cent. greater than it now is. It is true the Eberhardt Company require water, but why do they not use the springs which they purchased? The last report is that they are to consolidate with a company owning a mill, and secure the Chloride Flat ground.

We have another White Pine Company in London, brought out by parties who were advised not to have anything to do with it, as no ore could ever be seen by anyone in White Pine in the so-called shaft, and their work, which has been carried on for a few months, falls to show a bit. This is a modest, small company, but the loss is all the same to those who invest.

By reference to correspondence published in the *Mining Journal* last spring or summer, I see the names of a firm of solicitors used (White Pine solicitors) as having passed on the title. This firm say they had nothing to do with it; but, on the contrary, they were solicitors for another company, whose patent they say covered the ground now being so diligently explored. Should not such folly be open to discussion?—*Dec.* 13. A MINER.

MINING IN THE WHITE PINE DISTRICT, NEVADA.

SIR,—A letter appears in the Supplement to the Journal of to-day (Dec. 9), purporting to come from "A Working Man," and to give a description of the White Pine mines on Treasure Hill. It, of course, is a question for your own judgment as well, but certainly, as a shareholder in some of the mines referred to, I think it exceedingly unfair that any random correspondent's communication should be admitted into your columns contradicting important facts, without any guarantee being afforded of either the accuracy or the *bona fides* of the writer. Ought it to be taken for granted that a White Pine address implies due information, ability, and trustworthiness? I must say that when the effect of some far off written statement is to blacken the good repute of a series of well esteemed mines, something more than a mere local American address is requisite to justify its insertion in the Journal, unable as it is to circulate a reply till a whole week has gone by.

So far as the Eberhardt, for instance, is concerned, "A Working Man's" statement is palpably untrue. Is it credible, I ask, that the Eberhardt directors should be outlaying 30,000*l.* at this moment on water for the purposes of mines barren and used up, as he describes them to be, and, therefore, not even worth that sum in intrinsic value? It is manifest they must know better what they are about than this, and, therefore, ought not to have to meet so gross an imputation of ignorance or recklessness as "A Working Man's" account casts upon them. I ask that like publicity may be given to this. G. W. PIZZEY.

Berkhempsted, Herts, Dec. 9.

PROSPERITY OF MINING—MINERS' PAY.

SIR,—Having returned to reside in my native town, after an absence of many years, I am pleased to find that mining is in such a prosperous and flourishing condition, and that our great tin mines (especially throughout the length and breadth of Cornwall, from New Great Consols in the extreme east, with its 300,000*l.* worth of reserves already discovered, to the far-famed Botallack Mines in the extreme west, not forgotting the celebrated Dolcoath, Cook's Kitchen, Tincroft, Carn Brea, and many other mines, which are two numerous to name) have all increased in value, and handsome dividends are being paid to the fortunate shareholders, with the price of tin at such a high figure. All these facts augur a prosperous future for the inhabitants of the dear old mineral county, provided "Live, and let Live" be the motto and order of the day.

But in the midst of this prosperous condition of the county I find, from many enquiries I have made, as well also as other unmistakable evidences, that the *working* miner's pay remains much the same as for many years past, in the face, too, of having to pay a higher price for his provisions. I think the time has arrived that all managers of mines, as well as all gentlemen connected with mining, should give their attention to this important matter without delay, and let the working miner have a part of the golden apple, which seems to be passed to the mouth of everyone but those persons who

provide the bone and sinews in their dangerous and arduous toil in excavating the minerals from the surrounding rocks, and thus carry out the golden rule—"To do unto others as we would wish to be done unto."

No doubt I shall find some persons connected with mining to object to my mode of reasoning on behalf of the working miner; yet I believe that every unprejudiced person who feels an interest in the wellbeing of the community at large will agree with me that the working miner, as well as some underground agents too, have just and reasonable claims to be entitled to higher pay, and if their claims are not complied with I fear that hundreds of our best miners in the ensuing spring will find their way to the splendid mineral States open to them in North and South America, where employment awaits them, and good pay too. I hope this subject will be continued by a more able pen than mine. A TRAVELLER.

Camborne, Dec. 12.

"WHAT TO SELECT—WHAT TO AVOID."—No. III.

SIR,—The advocates and supporters of legitimate mining, whether as a channel of profitable investment or a source whence our national wealth is augmented, cannot fail to have observed with unmixed satisfaction the announcement recently made by the *Times*, that there is intense mining excitement in Cornwall, the fortnightly "settling" in Redruth alone being so extensive that the business occupied two days, more than 100,000*l.* having changed hands; that five new or revived mines have been set to work since the last report, and at least 13 new and powerful engines are now being erected in the districts of Gwennap, Redruth, Camborne, and Hayle, while one firm has in hand five others; and that the rise in the price of shares in tin mines is something marvellous. Tincroft, which the other day divided 12,000*l.* as a profit of one quarter's working, has advanced to the extent of 120,000*l.* on the value of the mine, or 70*l.* per share; while Dolcoath has gone up from 190*l.* to 300*l.* per share, equal to an advance on the value of the mine of 150,000*l.* Wheal Basset shares a few months ago changed hands at 70*l.*, and are now 150*l.*, the difference being 38,000*l.* on the value of the mine. South Frances shares have advanced from 25*l.*, to 75*l.*, increasing the value of the mine by 24,000*l.* North Roskear has risen from 6*l.* to 50*l.* per share, a difference of 30,000*l.* on the mine. Cook's Kitchen has improved to the extent of 66,000*l.* on the value of the mine. St. Ives Consols have advanced from 5*l.* to 15*l.* per share; Creegbraws from 30*s.* to 16*l.* per share; East Basset from 6*l.* to 16*l.*, &c. The *Times* adds that it is expected at the Dolcoath bi-monthly meeting a dividend of 5*l.* will be declared; that Carn Brea has given a dividend of 3*l.* per share, equal to 3000*l.*, carrying forward a credit balance of 5148*l.*; the tin during the three months fetched 10,396*l.*; and that South Caradon has given a dividend of 3*l.* to the 512 shareholders, leaving a balance of 2362*l.* My object in now re-producing these substantial facts, upon which the *Times* appears so jubilant, is for the purpose of congratulating those who, like myself, have a direct interest in upholding *bona fide* mining upon the satisfactory and encouraging tone in which the "leading journal" is continually referring to this class of enterprise; for not many months have passed away since its every reference thereto was utterly dispiriting and obliterative of that "silver lining" poetically inseperable from "every cloud."

It is probable that the history of mining may be without a parallel as to the extremeness of the depression which for a long time pervaded our home mining centres, and never perhaps were the indications of "the better time coming" less visible than when the extreme verge of despair had been reached. The *Times* described the mining population of Cornwall as an army of helpless paupers, the unremunerative price of tin and copper causing the stoppage of nearly the whole of the progressive and threatening the very existance of our most established dividend mines. Then it was that tin, selling at 45*l.* to 50*l.* per ton, was predicted by lugubrious *quid-nuncs* to be irrecoverably depreciated.

The production of foreign tin mines was to be forever equal to any demand, and as by the many economical advantages possessed, including cheap labour, our foreign competitors were able to send tin into the market at 50*l.* per ton, realising good profits, it was "hoping against hope" that a higher market value would ever be established. But what has been the result of all these gloomy forebodings? Why, that within a comparatively short period tin has advanced to a much higher price than hitherto known, at least in modern times; and, according to the authority of the *Times*, there is throughout Cornwall strong confidence that it will yet reach much higher prices; which is the opinion of Mr. Wm. Teague, than whom perhaps, there is no better authority upon the subject, who has recently stated "he has a firm belief that tin must improve."

As to copper, we were taught to regard the "Copperopolises," discovered in different parts of the world, as the inevitably "swampers" of all our home mines producing that metal. This, however, as I pointed out last week, has remedied itself, and, as your metal report, informed us last week, "It is thought impossible that, for a considerable time at least, the supplies will be commensurate with the demand, and thus it is that far-seeing buyers have laid in their stocks, and speculators have purchased to hold for a rise, the market closing with increased activity." The moral of this is that the recuperative powers of mining, as regards its profit-yielding capabilities, are so exhaustless, that however severe may be the depression it is sure to prove only temporary in character; and this must be, perforce, more marked in the future than it has been in the past, by reason of the progressive expansion of trade demanding increased supplies of the various metals.

GREAT WHEAL VOR is opening out in a manner justifying the hopes that the day is not distant when it will resume its position in the Dividend List. The western ground, which the late Mr. Noakes had for many years confidently regarded as the most valuable portion of the mine, is proving itself to be equal to all anticipations; and the general prospects are such as to warrant the belief that in this direction—where there is an amount of virgin or unexplored ground equal to the entire remainder of the mine—there will be opened up an extent of wealth that may bear favourable comparison with anything heretofore returned from this great mine. The tin is probably the richest of any in Cornwall, the last sale realising nearly 100*l.* per ton; monthly profits are being made, and if the almost astounding progress made during the present year—despite many vexatious drawbacks and expensive hinderances—can be accepted as any criterion as to the future, few shares would appear to deserve more attention. There has been some slight reaction in the quotation for the shares, in sympathy with all others at this season of the year. The latest advices, however, state that the mine is looking better than it has done for many years past, the western ground opening out very satisfactorily, while the bottom level, west of Ivey's, maintains its value. At the meeting, to be held on Thursday next, the accounts will show a net profit upon the three months' operations ending with September of nearly 1400*l.*

SOUTH AURORA shares are neglected, even at their present heavy discount; but if the information that has come to my knowledge goes for anything at all—to say nothing of the mooted amalgamation—those who were induced to purchase at higher quotations should consider the advisability of averaging, for, notwithstanding whatever may be said to the contrary, it is extremely unlikely that the operations about to be commenced will not result in further discoveries. The White Pine Mines have no doubt been too highly valued, but it does not therefore follow that they are absolutely valueless; and with regard to South Aurora, even Mr. Hague himself anticipates, upon further development, that bodies or chambers of ore will be found.

1, *Pinner's-court, Old Broad-street.* FREDK. W. MANSELL.

CAUTION TO INVESTORS—"CIRCULAR" MINING.

SIR,—As I have always considered your Journal is conducted with a desire to give legitimate information to the public on mining matters, without in any way attempting to unduly "puff" any scheme which may be put forward, I am sure you cannot do a greater service to the investors in mining property than by inserting in next week's Journal a few words of warning to put your readers on their guard against accepting without some enquiry the statements which are every week being made in circulars issued by so-called "mining" and "financial" agents. These gentlemen are apparently daily increasing in number, and their "circulars" are becoming a perfect nuisance. I speak within bounds when I say that a dozen different firms have solicited my patronage for selected shares during the last month, including properties in all parts, but chiefly in Wales. They may be legitimate mining speculations, but as I notice that one and all of these agents in "finance" (?)advise purchases at about 10 per cent. premium I think the public should beware of them. It is possible many of the gentlemen paraded as directors of these concerns are not aware of the liberty taken with their names. If they were we might hear that they discountenanced such a style of puffing. INVESTOR.

EAST AND WEST LLANGYNOG SILVER-LEAD MINES.

SIR,—Immediately adjoining the Old Llangynog Silver-Lead Mine, formerly so very rich, is West Llangynog, in 10,000 shares of 2*l.* each, or 20,000*l.* for the mine. It appears from the report presented at the last meeting of shareholders that within 250 fms. of the mine is a course of silver-lead in Old Llangynog, 3 ft. wide, and that West Llangynog is on the same lode. West Llangynog, moreover, is at present appraised at 20,000*l.*; East Llangynog (formerly named Craig-y-Mwyn) at 150,000*l.*, and some authorities tell us that the shares will go to 20*l.* each, or a million sterling for the mine. Sir, there is a manifest difference—a mighty disproportion between these several amounts. I have for some time watched the proceedings of each company, and of the two mines it certainly appears to me that West Llangynog is likely to prove the best; but I should like to have the opinions of other correspondents that we may be better able to judge, for guidance for investment.—*Dec.* 12. DEVONIENSIS.

P.S.—Allow me to thank you for affording the readers of the Journal (who, in common with myself, are precluded from attending Mr. Smyth's very interesting course of lectures at the Royal School of Mines) the opportunity of perusing them in your valuable columns. Mr. Smyth, I perceive in his last lecture, endorses my statement in regard to Old Llangynog Mine—"That the vein wedged out in the deep."

POLBREEN MINE.

SIR,—In a recent number of the Journal appeared a letter from a "Shareholder" in this mine, complaining of the non-payment of dividends, as promised in "The Financial Gazette." In the first place, let me say I am sorry that someone more intimately connected with the above mine has not replied to this letter. We were promised two dividends during the year now drawing to a close, but the dividends in Polbreen would appear to be something like those in the Virtuous Lady Mine; they exist only on paper. I should like to have some authenticated particulars respecting the position and prospects of the property. With tin at such a high price, we ought to have some satisfactory reports. A SHAREHOLDER.

[For remainder of Original Correspondence see to-day's Journal.]

THE FLAGSTAFF MINING COMPANY.

We have received a daily record from the Flagstaff Smelting Works, showing the product, expense, and net profit, which we publish as an example of the system adopted by this company. The mine keeps a similar record, showing the number of men employed, amount of ore raised from the mine and sent to the works, timber used, and every incidental expense. The daily report of the smelting works is as follows:—

Little Cottonwood, Sept. 12.

Number of tons of ore raised		18
Gross value, gold, silver, and lead—134 bars, 16·080 lbs., or		$2484·31
Less loss in separating		77·18
Total		$2407·13
EXPENSES—Charcoal, 648 bushels, at $0 25	$162·00	
Iron ore, 3200 lbs.	32·10	
Lime rock, 3000 lbs.	7·50	
No. of men employed at furnace, 16, at $4 per day	64·00	
Incidental expenses	20·00	
Freight from works to Omaha, $34·50	274·80	
Cost of separating bullion, $22·50	180·40 =	740·70
One furnace running, net		$1667·43

Signed by the Manager.

THE YUBA AND ATLANTA MINES, IDAHO.

(From an occasional Correspondent.)

A company has been incorporated in Oregon for the construction of a line of railway from Portland to Salt Lake City: this road is to pass through the Snake River Valley, and will bring the mining districts of Idaho into direct communication with the Eastern and Western States. I have recently visited this part of the country for the purpose of examining mining properties in process of development. The largest, and apparently the richest, mine is the Atlanta, which I am informed is under offer for sale. I was present when about 4 or 5 tons of ore were brought from the shaft, such as would have created the greatest excitement in Salt Lake Valley or Nevada. It consisted of large masses of native and ruby silver, the remainder being a rich antimonial sulphuret, averaging 100*l.* to 500*l.* per ton. The Atlanta is an immense lode, and has been examined by several practical miners from England, who consider it a vast and rich mine, and the mother vein of the district.

The mine next in importance and value is the Stanley, recently purchased by an English company—The Gold Mining Company of Yuba (Limited)—they have a compact well built 10-stamp mill at work, at present crushing ore from an adjoining mine called the Leonora. The Stanley is a fine silver-bearing lode, about 18 ft. wide, well developed by a tunnel high up in the mountain, where it shows visible gold. Most of the mines in this district have gold in the cropping, or near the surface, and the gulches pay well for working as placer mines. At a greater depth the ore carries silver chiefly. The county rock is granite, and the veins are mostly in true fissures.

The Yuba Company have an energetic manager in Mr. S. Mattingly, who at the time of my visit was enlarging the mill, preparatory to putting in pans and concentrators to crush silver ore from the Stanley Mine, on which a working tunnel is being driven at a lower level, which will cut the lode between 400 and 500 feet below the upper tunnel. During Mr. Mattingly's absence in England they had cut several large spurs, which they mistook for the lode itself, by which some time had been lost. They are now, however, only about 30 feet from the main body of ore, which, judging from its character in the upper tunnel, and the spurs already met with, is expected to be of high value. I was assured by the manager that in a few months he would be in a position to forward handsome dividends to London. There are several other lodes in Yuba and Atlanta, which look well, but require further development.

Rocky Bar, on the South Boise River, is the centre of another new district, but here the mines are gold-bearing lodes chiefly. Several are being worked at a profit, but it is amazing to see the vast quantity of gold lost for want of suitable machinery and appliances. There is not a single mine that is yielding 40 per cent. of the assay value of the ore, from this cause alone. One of these mines, which may be said to be only just opened, has already made the fortunes of three or four of the original locators, whilst placer mine in the gulch below are reaping a rich harvest from the tailings.

The Ada Elmore is a splendid lode, rather narrow, but exceedingly rich; its average yield is said to be $125 (or 25*l.*) to the ton. A portion of it is owned by the Pittsburgh Company, a Pennsylvanian corporation. Capt. Oram is the manager, who is putting up a 20-stamp mill, which will commence running this winter.

The Wide West, on the Red Warrior Mountain, is also being worked to a profit; the gold is exceedingly fine, worth $19 to the ounce. Its present yield, through an arrastre, averages $33 to a ton, and the working expenses do not exceed $12. These lodes are in true fissures, and, therefore, not likely to give out, while the ore itself is found to increase in richness as they sink deeper.

NEVADA—CALIFORNIA MINES, AND ENGLISH INVESTMENTS.

Time was, in the old days of ignorance and inexperience, when California mines were a byword and an eyesore in the English market. Those were the times when Grass Valley was supposed to be the centre of the gold region, and unskilled directors were sent out with cumbrous machinery, which naturally proved a total failure. It took years to do away with this prejudice against quartz mining, but the truth has at length pierced even through the hard objections of English capitalists, and we rejoice to say they have no reason to regret their return to confidence. Let us take, as one instance, "The Richmond Consolidated Mining Company of London," whereof the mines are situate in Lander County, Eureka District, State of Nevada. These mines were sold to the company by Mr. J. M. English, and they are now netting $25,000 a month. Two large furnaces are now in course of construction, indeed, are nearly completed, which will increase the net monthly product to $90,000. This is one of the best purchases ever made by a British Company, and Mr. English deserves the thanks of the people on this coast for placing such worthy investments in the hands of foreign capitalists. Such investments as these gain the confidence of the public, and pave the way for millions of hoarded wealth to be brought out in aid of the development of our boundless resources.

The above, from the *San Francisco News Letter*, reminds us that in February of last year Mr. George Batters organised a company with a capital of 60,000*l.* to purchase the adjoining mine to the Richmond Consolidated—then called the Champion—but now organised in San Francisco under the name of the "Eureka Consolidated." Captain Brown, then manager of the Pacific Company's mines at Austin, and Captain Frank Evans was selected to report upon the Champion, and they in their astuteness reported that it was in flat pipes, and had given out in depth. Although counter reports by Capt. Wm. Nancarrow, Capt. Scaddin, and Mr. Julius Allington strongly recommending the purchase were subsequently secured. The damaging reports of Brown and Evans determined the company not to complete the purchase. The same property was immediately taken up in San Francisco and is now selling in that market at the rate of 250,000*l.*, having paid dividends for the past six or eight month at the rate of 10,000*l.* per month.

CAMP FLOYD, UTAH.

A correspondent of the *Salt Lake Herald*, writing from Camp Floyd (Nov. 15), says:—"This district is all excitement, the recent heavy sales of mines within it having caused a great influx of prospectors and speculators. The town of Lewiston is overflowing with people. The Silver Cloud Mine here was sold some time ago for $350,000, by Messrs. Howland and Co., to Messrs. Williams and Colterel, of London; and part of the purchase money ($135,000) was paid in New York on Wednesday, the draft having been received in this city yesterday by telegraph. The purchasers of the Cloud will immediately put up a 20-stamp mill to work the ore of the mine, and parties posted say they would not take a million and a half for it to-day. The new owners in the interim have leased the Walker Brothers Mill, and have made a contract with a Mr. Standish to freight ore (of which there is a large quantity on the dump) from the mine to the mill. The Queen of the West, owned by Messrs. Sanger and Co., of Chicago, shows a large quantity of medium grade milling ore on the dump, with an excellent prospect of a large and permanent lode of the same class of ore in the mine. Preparations are being made to work extensively the Sparrow Hawk, Last Chance, and Marian Mines, recently negociated in London by Capt. Shaw, and active work is to be immediately resumed upon the Mormon Chief and Grecian Bend, owned by an Omaha company."

The Sparrow Hawk, Last Chance, and Marian Mines, above mentioned, containing a lineal extent of 3000 ft. on the mother lode of the district, is the property of the Camp Floyd Silver Mining Company (Limited). Capt. E. H. Shaw, general manager of the company, is now on the ground, and writes (Nov. 13) as follows:—"The mines are looking well, and there can be no doubt of their value. I have taken Mr. Allen (of White and Allen) to see the ground, and estimate cost of mill. They are building a mill for the Raymond and Ely, at Pioche (30 stamps), and stand high as millwrights. They built the Walker Brothers Mill, in Ophir, four miles from Camp Floyd, and several other mills that work well. They will build a 20-stamp mill complete, and run it one month after it is done to prove its efficiency, for $60,000 (12,000*l.*); or they will build 20 stamps, with power and room for 30 stamps, for $65,500, and will push the work on as fast as possible. The ore does not need calcining at present, and will not till water level is reached, and probably not then; but they will make room for a calcining furnace, so that it can be put in at any time. I think it best to let White and Allen build the mill by all means, as they have over 100 men at work for them, and they can complete the job sooner than anyone else. I will certainly do what is best for the company, and shall not only use my own judgment, but will consult with the best millmen and miners in the country."

It will be seen from this letter that Capt. Shaw was correct in his estimate of the cost of a twenty stamp-mill, however sceptical some of the company were as to his ability to get it done for that price, seeing the immense cost other companies have been put to in the erection of similar works. The company are singularly fortunate in securing the services of Capt. Shaw, as he is an old and well-known resident of the Pacific coast, and having had great experience in mining matters will doubtless save to the company thousands of pounds that usually, and almost necessarily, go to buy experience in a new country. The mill will be running in a very few months, in the meantime there will be a large force of men put on to the mines, thereby insuring an ample supply of first-class to keep the mill in continuous work. A late telegram from the mines says there is a great amount of good ore in the shaft. This proves the mine good in depth, as this shaft is started from the tunnel, which is 70 feet from surface. Thus proving the vein body over 30 feet wide, and nearly 100 ft. deep. There is no doubt that this company will soon take rank as one of the best on the London market.

EUREKA—RICHMOND CONSOLS.—The mines of this company comprise the Richmond, Colorado, and Virginia, located on Ruby Hill, immdiately adjoining the property of the Eureka Consols on the west. The amount of ore in sight in the Richmond is immense. The bed vein by actual measurement is over 100 feet in width. There are some 500 feet of drifts, all hewn through solid ore. Our attention was called to one column of ore over 30 feet in height, estimated to contain 3000 tons. The furnace yield for the month of September was $64·36 per ton. The smelting works consist of one large-sized blast-furnace, capable of reducing 40 tons of ore per day. Foundations have been laid for two furnaces of a larger size than the old one.

MINERAL WEALTH OF CALIFORNIA.—From all quarters of our mining regions we continue to receive the most encouraging news. Remarkable developments have lately been made in the Gwin Mine, Calaveras county. The *Chronicle*, of November 4th, says: "Developments have recently been made at the Gwin Mine, Lower Rich Gulch, unparalleled in the history of quartz operations in this State. A stratum of rock has been discovered in the main shaft, at a depth of 400 feet, that for richness eclipses anything of which we have ever heard or read. A portion of the rock was critically assayed by Dr. James Hepburn; 2½ oz. yielded 166 grs. of gold, or at the rate of $53,140 per ton. The Gwin Mine must now certainly be classed as the most valuable in the State." In this county a number of the principal mines are yielding ores averaging $70 to $86 per ton. Until lately, the valuable mines of San Gabriel, in Los Angeles county, have been worked at great disadvantage, owing to a lack of water. Now, however, a ditch, with a carrying capacity of 500 in., has been completed from the head waters of the San Gabriel to the mines, a distance of six miles. Hydraulic pipes, such as are used in the Northern mining districts, have been laid, and rich returns may soon be expected from these mines. The Erie Mine, recently located on Squirrel Creek, promises to be one of the richest in Nevada county, 15 loads of the quartz yielding the sum of $7419·22. The work on the North Bloomfield Company's dam and bridge is being prosecuted vigorously. Several discoveries of rich quartz lodes, with extensive locations thereon, have lately been made in this county, and two 10-stamp mills have just been completed. In Lake county a very rich silver mine was discovered a few days ago. All the quicksilver mines in Napa are in a flourishing condition, and give promise of a large yield in future. The Monterey Quicksilver Mine has been sold for $125,000 to a Philadelphia company. The quartz mines of San Diego are at present turning out from $8000 to $10,000 per month. The *Ureka Journal* states that "from actual survey lately made, it has been ascertained that a tunnel from the Shasta river can be built with ample fall the entire length of this basin." The reports of new discoveries and rich developments have been continual and repeated from every mining district in our State. We hear of preparations being made for the most extensive mining operations during the ensuing year, and predict a remarkably plentiful good harvest. In El Dorado the miners are busy cleaning bed rock; their prospects are fair, and should the season be a wet one, they will have a rich yield. From Placer county all the reports are of active operations and rich ores.—*San Francisco News Letter.*

QUICKSILVER IN CALIFORNIA.—The upper part of Napa county in the mountains to the eastward is being prospected for quicksilver mines, several leads of which have been struck. Some 15 or 20 companies have been incorporated, but none have put up reduction works except the Phœnix, in Pope Valley. The latter have been retorting out from $10,000 to $15,000 worth of quicksilver per month for nearly a year. Sixty men are employed in getting out ores, &c., and during the month 300 flasks of quicksilver were retorted. The Valley Mine is using retorts and extracting small quantities of metal. The Phœnix has struck a body of cinnabar of considerable extent, and value the mine at several hundred thousand dollars. The furnaces will cost $20,000.—*Scientific Press*, San Francisco, Nov. 18.

AMERICAN MINING.—We have been favoured by the President of the Eureka Consolidated Mining Company with a copy of the reports for the year ending Oct. 1: the statement of accounts showing a balance of profit (after paying five dividends—$225,500—to the shareholders) of $130,131·29 was referred to in the Supplement to the *Mining Journal* of Nov. 25. The company has 14 original locations, held by certificate. The patents will soon be forwarded from Washington, the Department having recently sent on for proofs of citizenship of the company's officers, which have been returned thither by the superintendent. The claims are held and patented as ledges and square locations. The extreme length of all the claims is 1680 ft., and the mean width over 800 ft., thus embracing very nearly the entire surface of the hill. Ruby Hill is an isolated spur from the main range, reaching down towards the valley. The footwall is a hard quartzite, on which is a clean clay selvage from 2 to 4 ft. in thickness; immediately upon the clay is found the lowest quartzy stratum of ore, rich in gold, moderate in silver, and almost barren in lead; above this is the true vein matter, 300 to 350 ft. in thickness, consisting of decomposed and compact oxides of iron, in and through which occur the true ore-bearing strata. As a general rule, the surface ores are the richer in lead; as depth is attained there is a general diminution in the percentage of this metal, and an increase, if anything, in the amounts of the precious metals. In all smelting operations the question of fuel is one of vital importance, the cost of charcoal alone consumed in the company's works being the largest single item of expense incurred in the production of the metal. Already the nut pine, the only wood suitable for coaling, has been cut off within a radius of ten miles of Eureka. With every year the price per bushel of charcoal must increase, and in view of the probably increased consumption in the immediate future, the superintendent suggests that steps be taken to test the feasibility of obtaining coke from some of the mines of the rock mountains. Charcoal now costs $40; coke can be made and delivered at Eureka for $32; and, owing to the greater smelting power of coke, the change would save one-third of the present outlay for fuel. The question may possibly be left in abeyance until the succeeding spring and summer, at which time the enhanced price of charcoal will necessitate its solution.

NARROW-GAUGE RAILWAYS IN THE UNITED STATES.—For secondary and temporary lines the value of the narrow-gauge principle can scarcely be doubted, for a 2 ft. or 3 ft. forms just as useful a feeder for main lines as those of wider gauge, and, if care be taken in laying out the line to make provision for substituting a wider gauge when the traffic may justify it, the laying down of a narrow-gauge road certainly should not be opposed. The system appears to be making some progress in the United States, and an interesting pamphlet has recently been issued (through Messrs. Nesbitt and Co., of New York) by Mr. S. W. Dorsey, giving statistical and other facts relating to them. Wherever the question of gauge is, as the Duke of Sutherland describes it, a question of railway or no railways, the cheaper lines may safely be adopted. The three-foot gauge will prove of enormous value to the mining counties of the Far West, and will place many districts in as favourable position for working as many districts of Wales and Cornwall. It is remarked that in addition to the Denver Pacific Road, which has adopted the three-foot gauge, 100 miles of which have been completed, there are many roads building in other States and Territories in the same region: 40 miles of the Arkansas Central and the 50 miles branch to Pine Bluff will be completed and in operation before the close of the present year, and most of the new roads will, in the first instance at least, adopt

that gauge. The importance of the Americans recognising the three-foot gauge can scarcely be estimated in considering the interests of English capitalists engaged in working mines in the countries mentioned. The fact of a mine being many miles from an existing railroad will henceforth be no great obstacle to its profitable working, for as the land for the line can usually be obtained gratuitously from the State, and as the cost of the narrow gauge plant and rolling stock is so small that even the present traffic would leave a margin of profit, the inducements to provide the required accommodation would be ample to meet the views of capitalists.

Royal School of Mines, Jermyn Street.

[FROM NOTES BY OUR OWN REPORTER]

LECTURE VI.—The arrangements, not less of pure science than of commerce, or, at least, that part of commerce which relates to mining, require that this portion of the subject—the occurrence of minerals in lodes—should receive more systematic attention than it has hitherto had from persons connected with mines. We shall find that at the present time it is only in a comparatively small number of mining districts, some across the Atlantic and some in Europe, where any intelligent acquaintance has been made with the phenomena attending the occurrence of minerals in lodes—a knowledge which would be of the highest importance—and there yet remains an amazing amount of uncertainty, which is fatal to the success of mining speculations. To those who undertake to explore certain districts such a knowledge would be of great advantage, and on it might ultimately depend the success of the mining enterprises of a whole country. The distribution of metallic substances in the veins, their dependence on the nature of the containing or walling rocks, and the extent to which lodes may be expected to set down in depth, are questions all of them of vital significance. The last is one of a really momentous character, and we have seen that it has been followed out in districts where otherwise it could not be done but for the intrinsic value of the metals obtained. In districts where mining is new great depths have been attained, in the face of a certain amount of prejudice, which suggested that it was unwise to pursue small veins deeper than 40 or 50 fathoms, it being held that veins do not bear ore to greater depths. It is surprising that such an idea could have acquired any force, as it is contrary to general experience in most countries. It has been shown that when veins have been subject to occasional nips or squeezes, and therefore to occasional poverty, this has been clearly traced to the rocks of a certain character at the side of, or near to, the lode; and yet it has happened that mines have been abandoned at moderate depths, after the expenditure of large sums, but which have afterwards been re-opened and worked again to advantage.

Looking at the map of Cornwall and Devon, there is another point to notice. A great number of mines were taken in hand by the ancient miners, and worked for tin to moderate depths, over wide-spread districts, evincing a great amount of perseverance for many years; but what has taken place in the last century has proved to us that a great many of these old tin mines are also valuable for copper ore, and have been carried down from 100 fms. to 300 fms. Indeed, there is no doubt that in very many cases, where the backs of the lodes have produced tin they have in depth given way to copper. In the last ten years it has been proved, by carrying mines still deeper, that the lodes have become poor for copper and rich for tin; and this present phase seems to show that these metals are distributed in zones. We cannot, perhaps, come to any positive and definite conclusions, but it is obvious that by following a lode from the surface we get the tin-bearing back of the lode; and then, at from 100 fms. to 300 fms. we have copper, and then we find a lower zone, in which tin ores come again. It would be interesting to know if a like arrangement is observable in foreign countries, but except in a few cases the lodes have not been followed to such depths. There are, however, well-known instances in the silver-bearing districts where the lodes, having been remarkable for the quantity of their produce down to 200 fathoms, have beyond that depth been found to be poor. This is the case with many of the lodes in Hungary, Saxony, and Mexico. It seems not at all improbable that they will continue to be so, both in Mexico and Nevada; at all events, the miners have not yet penetrated in these new districts to a sufficient depth, as you will see by the American Mining Reports, remembering that the figures given represent feet, as their system is, and not fathoms; but there has been seen to exist a series of zones, in which ore may be expected to exist. Whether this has to do with changes of ground is not clear; but I do not think that can be the case over a great area.

It is undoubtedly the case in many instances, as, for example, in the contact of granite and slate; where the orey deposits extend some distance into the one or the other with equal results, while in other cases they are better in the one than in the other; and, again, lodes which do well in killas and clay-slate will deteriorate on going into granite, or *vice versa*. These facts impressed themselves on the mind of a French miner named Fournet, but he came to the conclusion that this was going a little too fast, and that no metal was to be expected when they had a contact of crystalline with stratified rocks, and pointed to many cases (as, for instance, in Cornwall) in proof of his opinion. At the same time there are plenty of mining districts, which seem to have escaped his attention, where no such appearances can be seen. It may certainly be asserted that crystalline rocks exist below where we cannot see them, but those who hold Fournet's views should prove that point themselves. Amongst these districts I would specify all the great metalliferous mining regions of the North of England, where limestones are so productive of lead and zinc; and then, again, I would point to Cardiganshire and Montgomeryshire, counties which I should strongly recommend students to visit who wish to see and to trace lodes at the surface. They will find there extensive tracts of country where the grass is thin, where the lodes come up to the surface, and where there are a great many traces of the explorations of the ancient miners, who have left many remains of their operations, as well as excellent examples of extensive mining according to the practices of the present day. The student will, therefore, in those districts get ideas which he could scarcely obtain elsewhere. In these days it is not often that we can get an open country rich in lodes free from houses and fences. I mention this country for another reason. I have before mentioned that it is noted for the argentiferous lead ores which it yields, and it is besides very noticeable that the rocks consist entirely of clay-slate, though much contorted and twisted. Take the district from Aberystwith to Plynlimmon, and you will find it a mass of strange contortions. The rocks are of the kind called killas by the local miners, but geologically limestone and other rocks of the Lower Silurian formation. The strike of all these rocks is north and south, and it is observable that the veins are grouped in lines or bands, which run nearly north and south, and we may clearly speculate on the richness of the lodes on these particular lines being dependent on the character of the rocks. Nor is it difficult to make out how this is. There are some of the rocks of a hard gritty character, and in those the lodes become dead. In others of a fissury schistose character the lodes do better; but it is in the bands of rocks of a slatey character and of a grey colour that the lodes do best. Further examination will show how it is that the lode came to an end. For some distance if you walk across the country from Plynlimmon towards the coast you will see nothing but knobs of rock coming out, and there the veins are nipped up, and lose their productive character, and cease to be worked. It is this facility of observation that renders the district remarkable, and very much more may be seen at the surface than in Cornwall, where the surface has been covered with naturally spread materials, in the shape of drift, or sand, or clay. It is also noticeable that as a general thing whenever we find granite or any other crystalline rocks hard and angular, and suitable for building stone, they are not suitable for lodes. It has been attempted by a mining engineer of eminence in Saxony to draw up a table showing the relative richness of veins in different classes of rocks, and no doubt such a table would be of great importance in any particular district, although it would require a great amount of knowledge and attention to produce it. It is difficult, however, from the incessant alterations in the character of minerals in different districts, and even within small areas, to see how any such table could be made reliable. In the Freiburg district it so happens that the rocks least favourable for bearing ore are those which in other districts are the most favourable. Amongst the better class of ore-bearing rocks in Saxony are certain varieties of gneiss, greenstone, porphyritic slate, and mica-schist where it is very full of garnets, while the rocks which have a brecciated structure are unfavourable. In other places the reverse is the case, and veins go on well in these rocks till they come to where they break out, when the change acts prejudicially on them. On this point I must say a few words. Hithe to we have been considering these lodes by themselves, except that we know they frequently run in groups, as may be seen by the map of the Freiberg district, which shows an area of eight or nine miles long. In this the lodes have a distinct parallelism in one direction, while another set has a similar parallelism in the other, each set having characteristics common to itself, but not shared by the others. If we take a lode by itself we have seen that the structure may vary very much, and these variations will generally be repeated in the lodes which were parallel to it. Lodes which have a brecciated structure invariably exhibit evidences of mechanical violence, and they generally show not only that fissures have been opened, but that the same action was sufficiently forcible to break fragments off the adjacent rocks, fragments which show the roughness and sharpness of fracture, and in other cases parts of the lodes themselves. The specimens from brecciated lodes on the table give corroborative evidence of this mechanical violence. We shall see hereafter that lodes of this kind are frequently very dangerous to the miners, in consequence of their being occasionally cracked right across in places where the material is loose. The miners usually work from below upwards, and when they get to a cross joint of this kind a mass of material may be suddenly detached, fall on them and crush them to death. Sometimes the contents of the lodes will show that they have been filled at different periods.

There is one more case of the dependence of the minerals upon the detaining rock to be noticed, and one of great importance where it exists. The peculiarity is well illustrated in the ore-bearing rocks of Kongsberg, in Norway, and it is to be found in other districts, as, for instance, in Cardiganshire. There is a tendency at Kongsberg for certain bands of these rocks to run in a north and south direction, but they are thrown up to an extremely high angle, so as to stand almost perpendicularly. The rocks are very hard, being composed of gneiss, hornblendic schist, chlorite schist, and mica schist, most of them extremely close, hard, and tough. Amongst them are two bands from 30 to 40 fathoms in breadth, which go by the name of the fahlbands, which, when freshly broken, are extremely hard, but when exposed for a little time some of the constituents change character, and the mass becomes softer. There are no lodes in the shape of fissures, but the silver occurs in the fahlbands, which are also impregnated with red oxide of iron (the presence of which in that district is considered an indication of silver), sulphides of iron, copper, and since, and occasionally those of lead and cobalt. Through the mass, here and there, are found small veins, running almost at right angles, containing argentiferous ore and native silver beautifully developed. The remarkable part of the formation is that although the veins are continued in the adjacent rocks, no silver is ever found out of the fahlbands, except, perhaps, a few minute flakes in the cleavage planes of the schistose rocks. This description, however, only applies in every point to the first of the fahlbands. When the second was discovered, at no great distance, it was reasonable that the veins, so plentiful in the first, would be found there also. This proved to be the case, but unfortunately inferior in richness to a degree which almost rendered it not worth the working. There have been doubts thrown upon this, but the matter some years ago was referred by the Government to geologists and mining engineers, and they came to the conclusion that what I have described is the character of the ore-bearing veins of the district.

I now pass to another portion of the subject—the character of the appearances of the lodes at the surface, which are, as a rule, extremely different from those it might be expected they would put on, judging from what is seen at depth where the influence of the atmosphere no longer acts on them. These variations extend sometimes to great depths indeed, and the nature and character of the changes they undergo are of great importance. Indeed, everything which tends to give a true idea of the origin and filling of lodes must have a valuable influence on the conduct of mining on a large scale. There are two theories amongst many others which will have this influence more or less. One is that the lodes are cracks produced from mechanical action below, or at least that their contents have been ejected into them from below; while others, on the contrary, with Werner, a most eminent geologist as well as miner, at their head, hold the opposite view—that lodes are fissures, extending sometimes to great depths, and filled with material from above. The importance of knowing which of these theories is the right one will be at once apparent when it is perceived that if the former be true the supply of metalliferous material will increase in the deep, while the latter would produce just the contrary result. There are many known cases which may be quoted on the one side or on the other; but in consequence of the absence of a sufficient number of actual observations to give to either a preponderance of data, no general consensus has been arrived at. With regard to the appearances of lodes, I have already mentioned that some veins do not reach the surface at all. They are, however, generally visible at the surface over variable distances, sometimes extending to four or five miles, although more generally to a mile or a mile and a-half; but the thing which strikes anyone is that they do not present the same appearances at the surface as in depth. When a vein or lode comes to the surface it is called the outcrop, or back, or basset, or broil. When lodes are of a very small size, and consist of rocks of a solid impervious character, without the admixture of pyrites or other minerals easily decomposable, they do not exhibit much change, but, as the miners say, come up to the roots of the grass. Galena, zinc-blende, and tin ores are frequently met with under such circumstances. But if, on the other hand, lodes are of a large size, of a jointy character, and pass through rocks of a pervious nature, and if the lodes contain either copper pyrites or iron pyrites, then they will be found to be much changed down to great depths; and the miners will be put into great difficulties to decide the true character of the lode. I am now dealing with anogenic changes, or those connected with the surface influences of water and carbonic acid, in opposition to carogenic changes, which take place at considerable depths. The cover, which the outcrop has, also affects its condition. Thus, if it be close and tight, and impervious to water, as many kinds of clay are, the original character of the lode will be much more preserved than if the cover be of a porous material, easily penetrated by water and air, in which latter case there is usually a great amount of change. Hard quartzose lodes, which rise above the surface, may be traced over a considerable length of ground as a sort of ridge, the containing rocks being so much softer than the lode itself, and occasionally it has been known to stand out as much as 20 ft. Remarkable instances of this sort are noticeable in Bulgaria; in the Alston Moor district, where it is called "the backbone of the earth;" at St. Agnes, in Cornwall, where it is really a picturesque object in the landscape. In many cases it is quite easy to see the old miners' workings, and trace the various materials which contain the lode as they pass along over a certain length of ground.

Another remarkable instance is furnished by what is called the St. David's or Gold Lode, in the neighbourhood of Dolgelly, in Wales, from which a large quantity of gold has been taken. This lode, which is worked at an elevation of 1000 feet above the sea, and is almost vertical running east and west, stands up above the surface, offering itself, as it were, for the study of the miner. This however, is not the case of the softer lodes, which often wear down, and form hollows and depressions on the surface, thus giving a clue to their existence. In a metalliferous county if you see a gully running in the direction of the lodes, you will probably find a lode there. They are traced also by lines of more luxuriant herbage arising from the moisture of these surface water channels. What our miners call gossan, and to which the French give the name of "iron hat," *chapeau de fer*, (German, *eiserne hut*) is generally a ribbed ochreous material, consisting of what might be expected from the decomposition of a quantity of pyritous matter, amongst more or less crystalline quartz. The working miners abroad hold that no adventure is likely to be satisfactory if it has not an "iron hat." The Germans have a rough rhyme, which may be thus translated—

"A lode will ne'er cut rich and fat,
Unless it have an 'iron hat.'"

In Cornwall so much faith is placed in it that mines, ere now, have been taken up solely from the supposed excellence indicated by gossans in which not a particle of metal was to be seen. How much faith is involved in such a decision may be judged when I mention that in Cornwall there is no chance of meeting with copper ore at less than 30 fms. or 40 fms. deep, the same lode at the surface being utterly changed. If a gossan is found to contain particles of ores of copper there is no doubt as to the character of the mineral to be obtained below. [Amongst other specimens of gossans, Mr. Smyth here exhibited a piece taken from the depth of 150 fms. in the Sharp Tor Mine, in which copper ore was perceptible, and large crystals of cuprelite, beautiful octohedrons, an eighth of an inch long.] In the case of lead lodes, similar effects may be expected, especially if it be associated with pyrites, and it often happens that before the lead is reached the miners come upon a variety of green and brown gossans of different chemical characters. Our miners discriminate between different shades of colour, and thus they consider a hard brown gossan indicates ore of no value, but if it be a brown of a particular tint, with a certain amount of porosity of texture, they will tell you that the ore when reached will prove good. These appearances have been noticed and valued from a very early period. Agricola, who wrote his work in 1630, describes the Saxon miners of his day as being quite alive to the probabilities presented by the gossans, and also to the fact that different classes of gossan are associated with veins of different character. It is, however, important to bear in mind that gossans are produced by decomposition and were not created to be a guide to us, otherwise we may suffer great disappointments. All pyritous substances are liable to decomposition from the effects of carbonic acid and water; and lodes in which minerals of that character are enclosed will naturally be greatly changed near the surface. We then have to fall back upon our experience, or our mineralogical or chemical knowledge, to arrive at correct conclusions as to what is likely to be the character of the deposit in the depth. The same may be said as to iron ores. For instance, brown peroxide of iron is simply the gossan form of spathose iron, so important in the manufacture of Bessemer steel; but it does not follow that brown iron ore may be produced by decomposition. It is true that iron pyrites in some forms may be of value for iron smelting, but that is not what we want. It is rather to tell what will be the probable character of the ore when we reach it; and to that end we must employ our experience as to what has been the results, and what are the changes rendered possible by a long-continued exposure to the atmosphere, and to the other agencies which I have mentioned.

LECTURE VII.—Having devoted some time to the consideration of lodes, as regarded by themselves, the nature of the rocks in their vicinity, and the character of the changes they may be expected to undergo near the surface, it may be as well to remind you that those are points which it is necessary to study with minuteness, partly for the futherence of science itself, and partly to supply those indications to the miner without which he cannot make the most of our advantages, and without which he will be blundering in the dark. Amongst these vital points is the different structures the veins exhibit, and especially the various ways in which the orey parts are disseminated, or scattered, or distributed throughout the lode. We shall find that these are extremely different, and we cannot but be struck with the fact that variation is one of the leading points, and next to that the problem whether the variation can be referred to the character of the rocks adjoining the veins, which undoubtedly may be the case. The splendid maps published by the American Government to illustrate the mines of Nevada and California (which I am happy to lay on the table for your inspection) show exactly the same thing with regard to the irregular way in which the riches of the lodes are there distributed. One of them, a section portraying the shafts and levels, proves that the ore is scattered here and there, while long tracts of the lode, fairly tested by being driven and sunk through, contain nothing of any value. Although the mining of the Nevada district and its principal remarkable lode only commenced a few years ago, we may learn much from it, partly from the Government having employed well experienced men to examine and survey it, the results of which are published in the work of Mr. J. D. Haine on the subject; and partly because the entire population is devoted to mining, and more or less engaged in the search for minerals, so that we have in the course of a few years a quantity of work of which there is no like example in Europe; and an amount of activity, energy, and perseverance thrown into it, which has accomplished in so short a space of time that which otherwise might have taken centuries to accomplish. The result is that an enormous quantity of valuable ores has been extracted from the earth, and many phenomena of interest made known. One fact is clear, that the Comstock lode, which has yielded such an enormous amount of silver ore, presents exactly those conditions which to a great extent prevail in the lodes of Europe. Alongside this point comes that of the character of the walls or sides of the lode. I have mentioned that there are certain classes of rocks of which the miners in the district where they prevail can pronounce at once that they are likely to yield ores, or that they are hostile to that probability. It is a great thing to be able to form correct conclusions of this sort; but up to the present time all the general conclusions arrived at have met with a great many exceptions. Then the contact of the lodes with the sedimentary or crystalline rocks, and the effects produced thereby, is important; as well as the chemical and physical character of those rocks at the particular places with which we are dealing. On these latter points we may again refer to the new mining districts of America as affording a strong reminder of what may be seen here with regard to greenstones and dolomites, of a distinctly crystalline and porphyritic variety, cannot be regarded as bearers of metal; and opposite to this are rocks precisely the same as to composition and origin, which appear to be bearers of metal, or to exercise a beneficial influence on the metallic bearing of the veins. Referring again to a transverse section of the Comstock lode, it will show how very regular are the walls formed of syenite, but the ore lying at great distances, but wedging down to rock called by the Americans propylite. This is a rock of great importance, forming a great "horse" in the interior of the vein, but full of strings of silver. Propylite is a rock consisting of felspar, greasy hornblende, but it is sometimes of an earthy and at others of a porphyritic character. It is a fact of the highest interest that in most silver districts amongst the rocks through which any given lode passes some will be found which in hard specimens show no difference. Thus, in Mexico rocks of this kind are common. And, again, at Schemnitz and in Lower Hungary syenite is associated with propylite, and the silver ore there obtained is like that of the Comstock lode. Hundreds of miles from thence, at Felsobanya and Sagybanya, rocks of the same structure associated with silver ore are found; and so again in the mines of Peru, where the lodes are so remarkable for their abundance of the precious metals along with tellurium; ores of gold and silver are associated with this particular rock. The veins, it is true, are different in character, but the presence of the precious metals with that class of rock is very notable at so wide a distance. It is obvious, therefore, that there is an association between certain rocks and the precious metals, a fact which every mining student ought to pay the greatest attention to.

Another thing which also requires a close attention is the change which may be expected in veins with a change of ground in the depth. That is, having traced the lodes over the surface, what are the probabilities of its extending downwards? This is a question which in the New World as well as the Old is one of extreme interest at the present time. It has been shown that many lodes do not hold down beyond a very moderate depth, or, if otherwise, that they pass into fissures occupied by less valuable materials. Again, we see these fissures hold down with a notable proportion to the greatest depths miners have yet been able to penetrate, as much for instance as 450 fms., the work of penetrating to a greater depth being dependent upon the problem whether the results will pay the expense. If the formation of the country is of the same character, and likely to hold the same character to great depths, we may go on hopefully as to the extension of the lode in the depth. If, for instance, we are dealing with granite, and the deep masses of killas which lie between the bosses of granite, there is no room to doubt that well-developed veins go down to very great depths indeed. If, however, we have a certain class of rocks unfavourable to a distinct development of veins it will not be wise to count on greater productiveness as we go down. [To illustrate this point, the lecturer exhibited a bird's-eye view of Alstone Moor, with a vertical section of the workings, and the vein on which they were carried on, all of them being on one band of ore, the limestone being above and below it.] Other veins had yielded a little, but the great productiveness was in that one. In other places in the limestone are strata very distinctly bedded, and amongst them irregular deposits or nests of ore, such as are common in limestone, but we must be very cautious in forming conclusions as to the continued productiveness of such a mine, as such deposits often prove to be of small extent. Indeed, we see year by year how these precautions are more and more necessary, inasmuch as such vast sums are brought together by mining companies on the expectation that certain known deposits will be found continued in the deep, but which often turns out to be fallacicous, as when followed down into another formation they are found to be cut off altogether. With regard to the line of intersection of a lode with the surface, I have already mentioned the great importance which must be attached to scientific experience as to a great variety of materials likely to be produced by decomposition, and how gossans may extend to considerable depths. Indeed, two most notable cases exist in Cornwall, where the gossans extend to a depth of from 150 to 160 fathoms. One of these is to be seen on the granite hills near Liskeard, and the other at an old tin mine called the Ting Tang, in West Cornwall. Generally the gossans go down from 20 to 30 fathoms before they begin to give way to ore of a different character. There is another reason why gossans require attention, and that is that substances are found in them to an extent which renders them valuable, but often in such a way as not to be seen without close examination. The ancients worked over the backs of the lodes for tin and cassiterites, which are not acted upon by atmospheric agencies, and left many valuable minerals behind them. Then, native silver and gold may be found in these gossans, though perhaps only a mere trace. This is especially the case in Mexico, where they have worked for ages in gossans of a decomposed character, called "pacos," or being much stained by oxide of iron "colorados," containing native silver, or those valuable compounds of silver which are also found in this country, and which are so apt to elude the attention of the ordinary miners. In dealing with gossans, however, it is not enough to take a sample from one place, and because the assay of that sample yields valuable material all the rest must be like it. Such a course can lead to nothing but disappointment. Just as it is in the lodes as to the distribution of ore, so is it in the same degree with gossans. No fair conclusion, therefore, can be arrived at without taking samples from different points, and that not only in length, but in depth also. I now pass from single lodes to the consideration of the relation of the lodes to one another, for it is not very frequently that we find a single lode only existing in a particular district without parallel caunter or cross lodes. When we speak of parallelism it is in a sort of general way. If they were truly parallel they would never meet; but, in fact, they are often found running into each other. If in a given direction of comparatively moderate area we find a lode which has proved productive running in a certain direction, it is not unlikely that lodes in its immediate neighbourhood running parallel, or rather in the same direction, will also prove similarly valuable. Referring to the maps of Devonsire, we shall see certain veins running side by side for miles in length, and ores of a similar character are found in each of them. Miners call this "ore against ore," or the ores being opposite. In many of these cases the cross-courses or cross veins also run parallel. I have placed on the table a representation on a large scale of districts in Cornwall, in maps prepared by Mr. Symons, the eminent surveyor. They show the geographical features of the country through which the different setts, as they are called, or principal line of lodes run; and you will see what a number of valuable mines there are in the neighbourhood of Redruth (one of the most remarkable districts in that respect in the world) worked upon a series of parallel lodes, each successive parallel lode being proved valuable to a considerable distance. It will be remarked, however, that all these lodes are intersected by a great cross course, which is traceable through the entire length of the ground. It has been agreed by miners that where the veins make against the cross-courses they are always very productive, and within moderate limits there is no gainsaying such a conclusion. Let us consider what it may be supposed is the cause of parallelism. That which we call a vein is a fissure produced in the crust of the earth by movement either up or down, and it is not difficult to imagine that such movements may have been repeated at intervals over a whole district, and producing a number of fissures all in the same direction. The brecciated lodes which I have already pointed out, where broken pieces are cemented together obviously by the introduction subsequently of the cementing material, and what the miners call combs of quartz, in which the points are all towards the interior, all give clear indications of these gigantic movements. A careful study of these things will show that this has occurred over and over again, perhaps five or six times successively, and in the case of the greater lodes there are specimens exhibited upstairs in the Museum in which may be seen evidences not only of successive openings, but of successive depositions of other minerals. Again, there are cases in which the lodes so filled have had an accident, as it were, and are split across from wall to wall, and re-opened in that way.

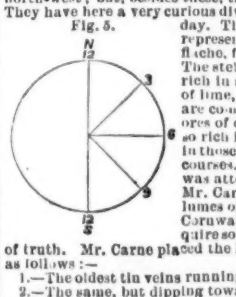
I do not know any more beautiful examples of this kind than may be seen in the Foxdale Mine, in the Isle of Man, where (the country being granite, slate, and killas) transverse fissures interfere with the lodes, and material of quite a different character has been introduced. A transverse section of this lode to a considerable depth would show these changes at every foot, and I may add that the mode of working has had frequently to be changed on their account. If additional proof be required that these fractures of the lodes were produced by movement, it will be found in the smooth surfaces called slickensides (German, barnisch), to be seen on the walls of lodes, or in joints which cross them. [The lecturer exhibited specimens.] These are frequently grooved or striated, and these striations are sometimes in one direction only, and at others in several. From the fact of being able to trace these through a number of materials there can be no doubt as to the facts of the case. As to the reasons, there are divers opinions, and some vague ideas have been put forward that these slickensides have been produced by polar forces. If, however, we look at what may be done in small cases we shall not find it difficult to conceive that these large smoothed surfaces, which oftentimes extend one mile, and to the depth of 10 or 20 fms., are the effect of the movement of vast masses of rock. Sometimes the stria are downwards, but more frequently they take an oblique direction. In other cases they extend horizontally for long distances, showing that a lateral movement on a large scale has taken place. These smooth surfaces are found in all sorts of material, and in the cases upstairs you will see a fine collection on copper and iron pyrites, spathose iron ore, and other metallic substances from English mines, and on cobalt ores from Upper Hungary, besides various non-metallic substances. [The lecturer pointed out on some specimens of capel out of a granite lode, the lines of striation beautifully marked.] Other corroborations are patent to anyone acquainted with colliery workings, where on approaching a great fault smooth surfaces are visible, due to action of the same kind, on which there is the same sort of polish and striation. Some coal districts have been subject to a great deal of movement, and the coals are much injured thereby, and unusual quantities of small coal produced.

When two lodes meet one cuts through the other and goes on in the country as before; or one masters or overpowers the other, as it were, and carries it away. The junction of lodes involves some important considerations, on account of the valuable influence it often has on the character of the produce. Amongst these it is commonly the case that where lodes meet at a small angle the probability is that valuable courses of ore will be produced. It is noticeable how miners depend on these junctions with other lodes, or the dropping in of strings, for valuable results. It is only by these junctions, or by the failing in of strings, that some lodes are of any value. At all events, where these strings drop in are the best portions of the lode. These are noticeable more especially in tin mines, and may be traced with great distinctness. Miners are in the habit of saying that when anything drops in from the hanging wall it is apt to produce improvement in the lode for some distance from the point of contact. Sometimes these subsidiary branches may themselves be followed with advantage; but in all cases these droppings from the hanging wall are of importance. On the other hand, if the strings fall away on the footwall side it is said they rob the lode, but I do not know what reliance can be placed on this.

We will now consider of how many different classes these lodes may be said to consist. We have seen that in some cases there will be only one group of parallel lodes to be met with in a district. In others we have parallelism exhibited, not only in a distinct sett in point of position, but frequently in point of the metallic or non-metallic minerals they possess.

There is no district in the world where these phenomena have been more carefully studied than that of Freiberg, in Saxony, where in a distance of ten miles long by six miles broad there are about 900 lodes, the characters of which have been made out with a considerable degree of certainty. These lodes have been classified for many years by their direction. Some strike away to the north and north-east, and others run almost at right angles to them. Another series run north-west; but, besides these, there is only a small number of caunter veins. They have here a very curious divisional arrangement, based on the hours of the day. Thus dividing the clock-dial (Fig. 5) from 12 to 3 represent the veins called stehendeklüge; from 3 to 12 flache, from 6 to 9 spat, and from 3 to 6 morgen gange. The stehende gänge contains quartz, along with galena, rich in silver ore. The flache veins contain carbonate of lime, with barytes and silver ore. The spat veins are composed of barytes in large quantities, along with ores of copper and silver. The morgen gange are not so rich in silver. These appear to be well characterised in those districts, but none of them act the part of cross-courses. I may mention that a similar arrangement, was attempted in Cornwall some years ago by the late Mr. Carne. It will be found recorded in the early volumes of the Transactions of the Geological Society of Cornwall. His arrangement would now, perhaps, require some modification, but it contains a great amount of truth. Mr. Carne placed the lodes of Cornwall under eight different heads, as follows:—

Fig. 5.



1.—The oldest tin veins running east and west, and dipping towards the north.
2.—The same, but dipping towards the south.
3.—East and west copper lodes.
4.—Caunter copper lodes. [tallic.
5.—Cross-courses containing metallic substances, and cross-courses non-me-
6.—Certain newer lodes of copper and lead.
7.—Cross-flookans running north and south, and containing clay only.
8.—Sides running east and west, having the effect of dividing anything they may fall in with. Thus, in the Tamar district they intercept the copper lodes under the river, and dislocate them.

In this division it is hard to draw a distinction between 2 and 3, because, as I have already mentioned, tin lodes frequently pass into copper lodes. It may be remarked, however, that the conclusions derived from one district cannot apply to others without considerable modifications.

THE CHANNEL BRIDGE.—The invention of Sir THOS. PARKYNS, Bart., relates to the construction of bridges, viaducts, girders, and other struc-

tures of like character, the object being to support the roadway and load which such structures may have to sustain by means of one or a number of wire cables, or straight lengths of wire (by preference steel), formed into bundles, and stretched tightly across the span or space to be bridged over, the strength of the bridge, viaduct, or other like structure depending upon the great tensile strain which wire cables of this character are calculated to bear; but in case of wire cables the longitudinal ties may be metallic tubes, or other suitable materials, according to the nature of the structure to which they are applied.

Meetings of Public Companies.

PRUSSIAN MINING AND IRONWORKS COMPANY.

The ordinary general meeting of shareholders in this company (Preussische Bergwerks-und Hütten-Actien-Gesellschaft) was held at Dusseldorf, on Dec. 8.

Mr. W. T. Mulvany, President, in the chair.

The notice convening the meeting was read, and the usual preliminaries disposed of.

The Chairman said that with the establishment of peace not only is the prosperous condition of trade restored, but a rebound has taken place, carrying that prosperous condition far beyond the anticipations of the most sanguine. The most favourable circumstance in this reaction is, that owing to the industrial tendencies of the nation, and the various moving causes, there is sound reason to conclude that this prosperous condition will last. In fact, the general progress of industry in the district has been so great as to surpass the power of transport, and at this moment a partial break down of the railway system has in consequence occurred, which most vexatiously—even though only temporarily—retards their onward progress. This break down has, however, the advantage that it is felt, and consequently awakens the attention of all classes. All classes, including the railway directions themselves, recognise the necessity and mutual advantage of making the means of transport keep pace with the progress of industry, and there is reason to hope all classes will in their different spheres unite in assisting materially for this purpose; and the purchase of 120 10-ton wagons has been authorised, to be used under fixed arrangements with the railway directions in running special trains backwards and forwards daily between the collieries and the ironworks in one case, and between the collieries and special large consumers contracting with them for their products in other cases. The Cöln-Mindener Railway having still neglected the extension of the Emscherthaler line from Dortmund to the Zollern Colliery, the Prussian Mining and Ironworks Company were at last compelled, at their own expense, to lay a horse tramway from the Hansa Colliery to Zollern, to avoid any further loss by further postponement of the pit sinking at Zollern. However, they have now not only arranged for a connection by railway from Zollern to the Bergisch-Markische line, but arrangements are also making for a similar connection with the Rheinische Railway, which has at last got the concession for the extension of its line through the coal district to Dortmund, and they hope to the east. The result to the Prussian Company will be that in a very short time each of their four establishments will be connected with each of these three great main trunk lines of railway, and thus fulfil another part of the anticipations upon which the promoters recommended the establishment of the company. They have succeeded in sinking one of the pits at Zollern through the water-bearing measures, and effectually tubbing back the water, as detailed in the report of the direction. In a couple of months more it is expected they will reach the coal measures, and all the information they have collected from adjacent collieries leads to the conclusion that they will there have one of their richest coal fields, which was purchased on very moderate terms, and is likely to prove most remunerative.

The report of the direction states that the principal mines are so situated that the transport of the ores to the nearest stations of the new railway can be cheaply effected, upon good roads with a gradual inclination from the mines to the railway stations, and for an average distance of less than three-quarters of a German mile—say three or four English miles. The ores are abundant, and the cost of winning moderate, and the quality such as is now greatly sought for, and rising very much in price—viz., an easily smelting brown iron ore, with an unusually large percentage of manganese, and comparatively free from phosphorus and other injurious ingredients. Steps have, therefore, been already taken for opening the workings at three different points, so as to be ready to take advantage of the railway as soon as it shall be opened. The period is at length arrived with the commencement of the present business year, when the exploitation of the company's establishments, which are already in operation, may be reckoned upon with confidence to afford an amount of profit sufficient, after the payment of all priority interest and amortisation of loans, to admit of a handsome dividend upon the share capital. The nature of the business is such, that the results of the working can be seen with tolerable accuracy at the end of each month, and the end result calculated with sufficient certainty towards the close of the business year, or fully six months before the date when, according to the present provisions of our statutes, the dividend is payable. The direction has, therefore, proposed that the new talons, now to be issued, should be furnished with extra coupons for dividend on account, so that the profits may be divided half-yearly instead of once in the year. This proposition has been approved of by the council of supervision, and will now be brought before the general meeting for its sanction. In accordance with the amortisation plan of the priority obligations, 63 of the partial obligations are to be paid off at par on July 1, 1872, the numbers of which are to be drawn by lot at the present meeting. The advertisement will be found in another column.

DOLCOATH MINING COMPANY.

A meeting of adventurers was held at the mine, on Monday, and was largely attended. It had been rumoured that a good dividend would be declared—indeed the best since the last subdivision of shares—which proved to be correct. By the sale of 203 tons of ore, in two months, at over 88*l.* a ton, nearly 18,000*l.* was placed in the mine's exchequer. The costs were 9933*l.*, the profit 7253*l.* Much to the general satisfaction 5*l.* per 1432nd share was declared as a dividend (7160*l.*), leaving a balance in hand of 729*l.*, an improvement on the last credit of 94*l.*

The meeting was a noteworthy one also, because it unanimously decided to subdivide the shares into 4296ths; and, as unanimously and promptly, resolved to do away with dinners! Shades of the old cost-book adventurers—the owners of the 32nds and 64ths, who believed as implicitly in dinners as in ghosts and fairies—where were you? The attendances at these bi-monthly repasts had become so numerous, and the expense, labour, and discomfort so great, that—with an extension of the adventurers, numerically, staring them in the face—the principal shareholders suggested—a "Captain Teague," as the new meal of bread and cheese is to be called.

One other incident should be remembered—the shareholders cheerfully accorded the whole of their workpeople a day's wages for a Christmas box.

The business meeting was held in the offices—Mr. G. K. Cartwright in the chair, who said he was happy to meet the adventurers under such favourable circumstances. Their accounts looked well. The state of Dolcoath was good and promising. And he had very little doubt that if the price of tin remained at the present figure, or anything like it, they should have many and excellent dividends. The following was the agent's report:—

Dec. 11.—The engine-shaft, sinking under the 302, is producing a little tin. The 302, west of engine-shaft, is worth 10*l.* per fathom. The 302, east of new east, is worth 100*l.* per fathom. The 290, east of new east, is worth 6 *l.* per fathom The winze under the 278, east of new east, is sunk 8 fathoms, and is worth, for nine feet long, 25*l.* per fathom. The 290, west of old sump, is worth 120*l.* per fathom. The winze under the 278, just behind this end, is sunk 9 fms., and is worth, for 9 feet long, 120*l.* per fathom. The 278, east of new east, is producing a little tin. The 278, west of old sump, is worth 10*l.* per fathom. The winze under the 266 is worth, for 9 feet long, 50*l.* per fathom. The 266, west of old sump, is approaching the cross-course, and the lode is not of much value. The 224, east of new east, is unproductive. The 242, west of old sump, is worth 10*l.* per fathom. The 220, west of Harriet's, on the north lode, is worth 15*l.* per fathom. The 236, west of Harriet's, is worth 20*l.* per fathom. We have commenced to sink a winze under the 224, 9 fathoms before this end, where the lode is worth for 9 feet long 50*l.* per fathom. The 224, west of Harriet's, is worth 25*l.* per fathom. The winze under the 212 is nearly holed to this level. The 238, east of Stray Park, is producing a little tin. The winze under the 215 is worth, for 9 feet long, 15*l.* per fathom. The 215, east of Stray Park, is worth 35*l.* per fathom. The 42, east of Freeman's shaft, on the North Entral lode, is still unproductive.—J. Thomas, W. Provis, J. Tonkin, J. Bawden.

He called that an excellent report. (Applause.)

Capt. Josiah Thomas added that there was a great improvement in the 215, east of Stray Park. A fine-looking bunch of tin there was worth 35*l.* per fathom, and all the agents were glad to see some tin in that part of the mine; 40 or 50 men were now at work in the Stray Park part, and they hoped to gain some material advantage in this portion of the mine as they drove in their deeper levels. (Applause.)

Mr. Cartwright was quite sure any of the agents would willingly answer the questions of adventurers. The committee, after a due consideration of the question, had resolved to recommend to the general body of the shareholders that the shares be multiplied by three—into 4296 shares.

A Shareholder said there was little doubt that such a multiplication would increase the market value of the shares, but it would make no difference to permanent holders of them.—Mr. Cartwright said Mr. Mark Guy Pearse, one of their largest proprietors, was in favour of the multiplication.—Capt. Josiah Thomas: And some of the smaller shareholders also. They say that 280*l.* or 300*l.*, or the present value, is rather too high a price for investors generally. And I have heard an opinion favourable to so multiplying the shares as to bring their value as near as possible to 10 *l.* If the proposed change takes place we shall then be in only two-thirds the number of Tincroft, East Pool, and West Basset.—Mr. Cartwright: The committee recommend a gratuity of one day's wages as a Christmas box for every labourer in the mine. That will cost about 140*l.* or 150*l.*—A Shareholder: Never mind the cost of it.

Mr. Cartwright: Also that a dividend of 5*l.* per share be declared.

Capt. James Mayne moved, and Mr. T. T. Whear seconded, that all these propositions be adopted and acted on.

After the dinner—presided over by the Rev. W. W. Butlin, of Penpons—the Chairman gave the toast of the day, "Prosperity to Dolcoath." In doing so he remarked on the agreeable nature of the surprise caused by the 5*l.* dividend—an amount very few of the shareholders expected; but Dolcoath was a beautiful mine. (Applause.) Some people fancied there would be no tin at all at the 302 fm. level, and that, at such a depth, all mineral was exhausted, but they had a lode there which, for 15 fathoms in length, averaged 23*l.* a fathom, and in one end it was now worth 100*l.* The 290 had been a fine level altogether. At their last meeting this level was worth 50*l.* a fathom, one way; it was now worth 60*l.* on one side, and 120*l.* on the other. Dolcoath made a purchase of Stray Park, believing it would derive a greater advantage if it could work that mine from its own levels. Their 215, driven into Stray Park, was not of value for some time, but it was now worth 35*l.*, and several fine stones of tin had been raised there, and could be seen at the door of the account-house. In the 203 they were raising a very fair quantity of tin. This reminded him that tin was now a very wonderful thing, and the demand for it was so extraordinary that they almost fancied the metals had altered their values and they must shortly cover their saucepans with gold and coin their sovereigns of tin. However that might be, tin was increasing very much in value. The quantity of Banca tin was not increasing; that of Cornish was, but it could not equal the demand. Our county was now said to produce 1500 tons of tin a month, worth 1,50*l.*,000*l.* a year (the present price for Dolcoath mineral being about 90*l.* 12*s.* 6*d.* a ton for common, and 91*l.* 5*s.* for best fine—a fine price, which would yield them handsome dividends), yet such was the demand for it that in its hasty transfer from the smelting-house to the railway trucks it scorched the trucks. Its great absorbent was the tin-plate manufacture, which, in the first 10 months of 1871, made and exported plates of the declared value of 2,843,472*l.* as contrasted with 2,368,537*l.* in 1870. Having expressed his regret at the absence of Mr. Pearse, the Chairman, said Dolcoath was indebted to Capt. Josiah Thomas, Capt. Pearce, and the rest of the agents for the exercise of their abilities, so zealously and perseveringly, in the working and development of the mine. They were greatly privileged in having Capt. Josiah Thomas—a man who was wanted by many of the mines around, to bring his experience to bear on their mining affairs, and in possessing Capt. Pearce, who had shown such a deep interest in the returning of their tin in the very best and economical way. They were gentlemen of much value, and the adventurers were greatly indebted to them. Might they long continue in the employ of Dolcoath, and the mine enjoy the same prosperity as now.

Capt. Josiah Thomas felt much obliged to Mr. Butlin for his very flattering remarks about the agents, and he had great pleasure, for all the agents of the mine and for himself, in acknowledging the unvarying kindness of the adventurers generally to them. As far as Dolcoath was concerned he was glad to say the mine never looked better than at the present time. Probably it was never in so good a position as now, for they were working the mine to the best advantage. They had laid out large sums of money, for the last year or two, in the improvement of their machinery. Nearly the whole of their stamping and dressing machinery was new; and they were now in a position to return a larger quantity of stuff, and to work on more economical principles than any mine in the county. In fact, they were working at present on a more extensive scale than any mine had yet attempted; and it was only by working on this extensive scale, with their quality stuff, that they could make their operations remunerative. When they considered that Dolcoath ground was very hard, that the mine was more than 300 fathoms deep, that the tinstuff was only worth 35*s.* a ton, it became evident that in order to make 7000*l.* profit in two months they must be guided by the most economical principles. (Hear.) He did not like to prophecy, for no one could see very much into the future, but he thought he was fully justified in saying that, with tin at its present price, they could very easily give their present rate of profits and even somewhat increase them. At any rate, all the agents would do their best, for the benefit of their employers.—*Cornish Telegraph.*

[For remainder of Meetings see to-day's Journal.]

THE RAW MATERIAL FOR BESSEMER STEEL.

Although the manufacture of Bessemer steel has now become an established industry, the manufacturers are still confined to the use of ore of remarkable purity, and especially free from phosphorus; and, taking advantage of the constantly increasing demand for ores of suitable quality, and the high prices obtained for them, an influential company (to which reference was made in last week's *Mining Journal*) has been formed for working some extensive deposits in Spain, and shipping the ore to the English markets. The mere fact of some of the largest steel manufacturers and consumers of the purer qualities of ore accepting seats on the direction of the Bilbao Iron Ore Company should alone suffice to convince the public that ore of the desired quality is not readily obtainable at reasonable prices, within reach of the works at home; yet there appear to be some who, in their energy to utilise our native minerals, go a step too far, and assume that the importation of foreign ores is objectionable, and should be altogether discountenanced. It was stated in the prospectus of the company in question that the ironstones of South Wales, South Staffordshire, and Scotland are becoming exhausted, insomuch that the necessary supply for these districts has for many years been supplemented by the hematite ores of Cumberland and Lancashire; but owing to the great and constantly increasing demand for hematite pig-iron for admixture with iron made from inferior ores, and the extension of the Bessemer steel manufacture, nearly the entire produce of hematite ores is absorbed by the ironworks in the Cumberland district alone, and the price of these ores has advanced within the last two years 70 per cent., and hematite pig-iron for the Bessemer process 50 per cent.

To such a statement there can be no valid objection, and if the Bilbao Company can supply the ironmasters engaged in the Bessemer steel manufacture with ores analogous to the Cumberland hematites, and yielding from 50 to 60 per cent. of metallic iron, no doubt need be entertained as to the facility of finding a ready market for them. With a view to depreciate the merits of the enterprise, however, attention has been drawn to mines alleged to exist in the Forest of Dean and the West of England, which were described as being in closer proximity and more readily available, capable of producing superior ore, suitable for Bessemer pig-iron; but fortunately Mr. Bessemer, and Mr. Hardy of the Tredegar Iron Company, both equally unconnected with the Bilbao Iron Ore Company, have published the facts of the case. Mr. Bessemer knows the mines and the ore they produce; yet he writes that the Bilbao Iron Ore Company would have more correctly described the condition of the trade by stating that the greatly increased production of Bessemer steel has, within the last two years, doubled the price of hematite ore in England, and also greatly increased the price of pig-iron made from it, and that the development of the Bessemer steel trade would be immensely increased by the introduction into the English market (at a moderate cost) of a further supply of hematite ore from Spain, a fact which Mr. Bessemer (being wholly unconnected with the Bilbao Iron Ore Company) can, without hesitation, most emphatically endorse; nor does he hesitate to affirm that the construction of a railway and a line of steamers connecting these magnificent mines with our own country will be of almost incalculable benefit both to the steel and iron trade of the kingdom; whilst Mr. Hardy asserts, as the result of his experience, that the chief supplies from the Forest of Dean and Cornwall are very poor ores, yielding only 30 to 35 per cent. of iron. This view is confirmed by Mr. W. Mattieu Williams, who explains that it is well known that for Bessemer purposes a pig-iron especially free from phosphorus is required, and that all our ordinary ores, which have been deposited about organic nuclei, or are otherwise contaminated by the remains of fishes and other animal matter, are worthless for the manufacture of Bessemer pigs.

This is rather a serious fact for us, inasmuch as our supremacy as iron manufacturers has been mainly dependent upon the fact that wherever we have coal there is ironstone near at hand. But the same geological agencies which have deposited the organic matter of the coal have contaminated the ironstones with organic phosphates. Our island, in spite of its general mineral wealth, is very poorly supplied with iron ores that by their deposition among the more ancient rocks or otherwise are free from phosphorus. With the exception of little insignificant patches, we are reduced to a dependence on the Ulverstone district, and the vast development of the Bessemer demand is now rapidly working this out towards exhaustion. As to the Dean Forest hematite ores, it is very truly observed that they have been longer known and longer worked than any deposits of this class of ore in England; nevertheless, the total quantity raised in Dean Forest is under 200,000 tons per annum, while the amount raised in Cumberland and Lancashire exceeds 2,000,000 tons. If the Dean Forest deposits are so important, how is it that these ancient mines produce less than one-tenth of the ore raised in the modern northern mines? The importance of the Dean Forest deposits has, no doubt, been greatly exaggerated, while all that has been published greatly under estimates the vastness of the Spanish deposits, because the *whole truth* would but tend to engender incredulity.

It is gratifying to find that the ventilation of the prospects of the Bilbao Company has merely had the effect of increasing the rapidity with which the capital has been subscribed, Messrs. Chadwicks, Adamson, Collier, and Co., by whom the subscription is issued, pointing out that of the eight directors of the Bilbao Iron Ore Company five are directly and largely connected with the manufacture of iron and steel, and know only too well the impossibility of finding in England deposits in the remotest degree approaching the power of giving adequate supplies. Of the remaining three, one is largely engaged in the sale of both English and foreign ores of this description, and another has been many years connected with one of the largest mercantile houses in the kingdom, and possesses an intimate knowledge of the Spanish language and of the value of Spanish ores.

During the past five years they have been consulted with regard to the sale of so-called hematite deposits in almost every part of the West of England, but have invariably found, on obtaining independent scientific reports upon them, that either they have been defective in the proportions of metallic iron, or that they existed in such situations as would place them at a great and permanent disadvantage as compared with other sources of mineral supplies. It is only necessary further to state that Messrs. Lockhart, Tozer, and Co., the sale agents of the Bilbao Iron Ore Company, are enabled to assert that the various analyses of these ores prove beyond doubt that they contain as great a percentage of metallic iron, and fewer objectionable impurities, than the average North Country hematites, and that as to price, Spanish ores have been sold this month in Cumberland at 26*s.* per ton, thus verifying the anticipation in the prospectus, "that the price of these ores must before long approximate more closely to the values of English hematites."

NEW ARMY TRANSPORT.

It is a truism to say that as this is a most inventive age, and that every day brings forth a miracle, all branches of science are more or less productive of inventions, and one of the most important productions of the present day for our army transport service is that of Mr. W. Pidding's Steel Portable Rails.

This invention is applicable to every description of vehicles, and, unlike the cumbersome and almost useless traction-machine, the portable rails are totally unconnected with the wheels of the vehicle, but encircle, rotate with, and pass under such wheels, thus compelling them to run on the rails precisely as they run on ordinary rails, enabling, therefore, a horse to propel a vehicle carrying a much greater number of passengers than it could carry under ordinary circumstances. We venture to prognosticate that not only will this invention be generally adopted in the way of traffic and in the metropolis, but will prove a boon likewise to our army transport. After having inspected the diagrams, no one can doubt for a moment the realisation of all that is promised:—

1.—With Mr. W. Pidding's steel portable rails one wagon would contain four coppers—say, 30 gallons each,—which would cook for 400 men in the field, on the march, and in quarters, so ample is its construction.

2.—Portable Magazines: One horse could easily convey 2 tons or more of ammunition, to keep up with the army on the march.

3.—Ambulances could be constructed to convey eight men in beds by means of the portable rail, by motive-power, or by one horse.

4.—A portable surgery could be constructed, with medical comforts necessary for each regiment in the service, with six months' supply in one wagon.

5.—The portable rail wheels for gun-carriages would reduce the great number of horses now required—say, from six to two.

6.—The portable rail wagons for transport with motive-power, or one horse to each wagon, would meet the requirements of all transport for guns, baggage, &c.

"Those of our readers who know anything of the transport of a regiment in India will at once conclude that if the Government were to furnish the Indian Commissariat with such transport as is detailed above it would save thousands of pounds annually—to say nothing of its economy in our home service."—*Military Gazette*, Nov. 12, 1870.

I am preparing a document (by request) for our military authorities, showing further that the adoption of my invention by Government would render an army invincible against any superior force.

W. Pidding.

CONCENTRATING ORES BY AIR AND WATER.

An elaborate process for concentrating ores has been devised by Mr. W. Hooper, of Ticonderago, U.S. The first part of his invention relates to an improved process for concentrating ore by subjecting the same to the action of a rock-breaker or crushing, and then separating the reduced ore according to the different grades of fineness, and treating the various grades by a dry or wet separator, or by a buddle, in such manner that the ore is concentrated to the desired degree of richness, with the least possible waste. The second part of his invention relates to the construction of a dry ore separator, the action of which depends chiefly upon a bellows constructed with a flexible diaphragm capable of receiving rapid vibratory movement in combination with a sieve or porous bottom used as an ore bed. With this bellows is combined an air-tight bellows-chamber, so that no air is allowed to escape, except through the ore bed. The motion of the bellows is produced by cams mounted on the driving-shaft, and acting on shoes, in combination with or without springs. The ore is fed to the ore bed through hoppers, which can be raised or lowered, and which are connected with gauges extending across the ore bed, and controlling the depth of the stratum of ore thereon. Suitable partitions on the top of the ore bed prevent the mass of ore spread on said ore bed from becoming uneven. The ore discharges through an aperture in the bottom of the ore bed, so that the concentrated ore passes down through the bellows. With this bottom delivery is combined an aperture composed of two or more channels provided with a gate, so that through the upper channel will be delivered the gangue, or tailings, through the lowest pure or clean separated ore, and through the intermediate channel a mixture of ore and tailings. In the compound discharge-passage is placed a roof-shaped partition, to prevent the lower and heavier stratum of ore from being broken and mixed with the upper stratum of middlings.

Another part of his invention relates to a wet ore separator, or slime machine, in which fine particles of the crushed or reduced ore are treated, the separation of the light and heavy parts being effected by means of a sluiced endless apron, to which the ore is transferred through a mixing tub, and which has an intermittent motion imparted to it by a ratchet wheel and pawl. The said sluiced apron is strengthened by cross ribs attached to its under surface, and passes over rollers having their bearings in a frame or shoe hinged at one end, and provided at the opposite end with adjusting screws, so that it can be set at any inclination. The shoe is composed of two parts, connected by hinge joints, and provided with adjusting screws, so that it can be set at any inclination. Over the sluiced apron is placed a water-tank, so arranged that the water contained therein can be continuously discharged at suitable intervals, for facilitating the separation of the ore. Under the apron are placed hammers, operated by cam wheels, and caused to strike against the said apron for the purpose of shaking up the material. A perforated pipe, provided with holes, serves to throw jets of water against the apron for the purpose of washing off particles of ore. The bottom of the apparatus is roof-shaped, to prevent the light and heavy parts of the ore from mixing after they have been separated.

Mr. Hooper further proposes to use an improved "dumping buddle," which is hung on gudgeons in an inclined position, in such a manner that if ore and water are made to pass down over it the different constituents of the ore will arrange themselves thereon according to their different specific gravities, the rich ore remaining at or near the head of the buddle, and the middlings towards the bottom ends thereof, while the tailings pass over the lowest end of the same, and when the buddle is filled it can be readily dumped by swinging it round on its gudgeons. Partitions adjustable on the floor serve to keep the rich ore separate from the middlings, and the middlings from the tailings. With this buddle are combined a stirring tub and an oscillating feeder, which latter receives in one compartment ore and water from the stirring tub, and clean water from a suitable source. By using clean water at intervals pure ore can be produced at the head of the buddle.

Improvements in Fans.—An improvement upon the fan patented by Mr. Christian Schiele, in 1863, has been invented by Mr. R. Clarke, of Manchester. The vanes spring directly from the boss, and their faces increase in width from the boss for the greater portion of their length, the remaining portion decreasing in width to the circumference of the fan. The comparative breadth of each vane is increased, and the line of face of the said vane commences as a tangent to a circle described around the central axis of the fan, and curves outwards and backwards from the direction of revolution. The comparative areas of inlet and outlet openings and passages are increased. Guides are fitted to the inlet openings and to the entrance to the curved outlet passage extending around the fan. Additional inlet slots or perforations are formed around the main inlet or inlets, and are so formed as to deflect the air in the direction of motion of the fan.

Nail-Making Machinery.—The invention of Messrs. Dean and Horton, of Birmingham, consists in feeding and turning over the nail plate by feeding mechanism thus constructed. The feeder consists of a tube supported in front of the machine, within which tube a rod, to which the nail plate is connected, slides. The nail plate is advanced to the cutters by a weighted cord acting on the feeding rod. The feeding tube and rod are connected together by a pin and slot, and are supported in two adjustable supports, one at the nose end of the tube and the other near its outer end. The support at the nose end has an eye or loop, and the support near the outer end a hollow pinion through which the tube passes and slides. The feeding tube is geared to the hollow pinion by a key and a key way. An alternating semi-rotation is given to the feeding tube and rod so as to turn over the nail plate at the proper times by the pinion, described, a sliding rack worked from the main shaft of the machine gearing with the said pinion. The feeding tube has a limited longitudinal reciprocating motion given to it, and its nose end has a rising and falling motion given to it

by the operation of a double-acting cam, in addition to the semi-rotation described. The reciprotaing motion is for the purpose of drawing the nail plate from the cutters during the turning over of the nail plate, and the rising motion is for the purpose of permitting of the turning over of the nail plate. During the turning over of the nail plate it is prevented from advancing to the cutters by the action of a lever upon the feeding rod by which the nail plate is carried.

FOREIGN MINING AND METALLURGY.

The Belgian coal trade continues its endless complaints as to the want of trucks upon the railway lines. Things have arrived at such a pass that a few days since coal made default at the Charleroi gas-works, and but for the good offices of the directors of a neighbouring establishment the very metropolis of the Belgian coal mining districts would have been plunged in darkness. After such a fact as this, can it be a matter of astonishment if the proprietors of sugar manufactories and other establishments between Charleroi and Paris are compelled to become idle in consequence of the want of combustible? A meeting of delegates of chambers of commerce and industrial committees, held at Brussels under the presidency of M. Sabatier, decided that petitions should be addressed to the Chamber of Representatives in order to obtain a public and parliamentary enquiry, to be made both by representatives and industrials. A sum of from 200*l.* to 250*l.* was subscribed for the payment of expenses. Orders for coal come regularly to hand, and prices are firmly maintained in the Belgian basins. Coke is also advancing. Freights for Paris have experienced a slight fall, but rigorous weather which has prevailed threatens to stop all traffic by water. A strike which had occurred at the Sacré Madame Colliery, at Dampremy, has been adjusted without difficulty. In the Liége basin heavy orders for coal have been received for France, Holland, and even Prussia.

The Belgian iron trade is in a very satisfactory state. The products of the blast-furnaces and of the ironworks find a rapid sale, at firmer and firmer prices. Some rail manufactories still present only comparatively little activity, but this arises rather from the high rates demanded by industrials than from any want of orders to be executed; and the proprietors of Belgian rolling-mills expect to be able to secure next year good contracts at very remunerative rates. Quotations for rolled iron are maintained at 7*l.* to 7*l.* 4*s.* for first-class No. 1; and those for plates at 9*l.* 12*s.* to 10*l.* per ton for No. 2; an early advance seems almost certain. The difficulties which miscellaneous companies experience in laying in supplies of coal and iron continue to make themselves felt in Belgian industrial centres. Notwithstanding the appeals and representations of industrials and chambers of commerce, it is feared, however, that for some time to come there will be no possible change in a state of affairs highly injurious to the material interests of Belgium. The Ougrée Collieries and Blast-Furnaces Company will pay, Jan. 2, a dividend for 1870-1 of 1*l.* per share.

In all the French industrial centres a great number of works are deprived of coal, coke, and minerals, a circumstance which occasions total or partial stoppage of work. This state of things, coupled with the strikes, which are extending with great rapidity all over the North of France, tends to render the general situation of the French iron trade somewhat dull and depressed. In the Haute-Marne charcoal-made pig for refining is quoted at 4*l.* 16*s.* to 5*l.*; half coke-made, 4*l.*; and coke-made pig, 3*l.* 10*s.* per ton. Plates are quoted 10*l.* 16*s.* to 11*l.* per ton. A strike at Roubaix is not adjusted, and another seems imminent at Valenciennes. It is always the same demand which is made—a reduction of the working day to ten hours, an advance of wages, overtime to be paid for at half as much again as ordinary time, &c. The Baron de Lespérut, president of the Council-General of the Haute-Marne, has been asked by the metallurgists of the department to call attention to the reported fact that great companies have been formed in Belgium and Germany for the working of ironstone minerals upon a very large scale. The concern known as the Forges et Chantiers de la Méditeranée has been paying this month its obligation interest in due course.

Notwithstanding a slight amelioration in the aspect of the transport question, the quotation for coal remains extremely high at Paris, and the same may probably be said of the rest of France. It is especially from the districts accommodated by the lines of the Paris, Lyons, and Mediteranean Railway Company that the most numerous complaints are made with reference to the scarcity of railway plant. The condition of industrials in these localities is truly unfortunate. Grenoble has seen its gasworks on the point of coming to a standstill, and a great number of establishments in the valley of the Rhône have been obliged to suspend work in consequence of the want of combustible. The director-general of the Paris, Lyons, and Mediterranean has frankly declared that it is "materially impossible" for the company to furnish industrials with a certain minimum number of trucks every day, and that it is indispensable to give a preference to gasworks and other urgent consumers. A general strike has just occurred in the important coal bassin of Brassac and St. Florine. Twelve pits are stopped, and from 1100 to 1200 workmen have thrown themselves out of employment. They demand the removal of a director, the removal of an engineer, the removal of several foremen, a reduction of the working day to ten hours, the establishment of a uniform wage of 3*s.* 6*d.* per day, and the management by the workmen of the succour fund. These severe conditions are likely to involve long negociations and great losses for all concerned. The Pontgibaud Mines Company commenced the payment on the 5th inst. of a dividend of 2*l.* per share for 1870-1.

There has been a considerable rise in copper during the past month upon the principal European markets. At Paris English tough cake is quoted at 83*l.* per ton, and Corocoro minerals, pure standard, at 78*l.* per ton. At Havre, Chilian in bars has made 80*l.*; refined ditto, in ingots, 82*l.* to 86*l.*; Peruvian minerals, pure standard, 71*l.* to 72*l.*; United States (Baltimore), 76*l.* to 78*l.*; ditto Lake Superior, 80*l.* to 86*l.*; Mexican and Plata in bars, 66*l.* to 68*l.*; old yellow copper, 40*l.* to 44*l.*; red ditto, 62*l.* to 66*l.* per ton. At Marseilles, Spanish has made 74*l.*; refined Chilian and Peruvian, 82*l.*; red copper rolled in sheets, 86*l.* per ton. At Rotterdam, Drontheim has made 50 fls. to 52 fls., and Russian Crown 51 fls. The tin markets have become irregular, and prices display some weakness. At Paris, Banca delivered at Havre or at Paris has made 157*l.*; Straits delivered at Havre or at Paris, 158*l.*; and English delivered at Havre or Rouen, 158*l.* per ton. At Rotterdam, Banca has made 88¼ fls., and Billiton 88 fls. The zinc markets have revived, and prices display some firmness; transactions upon the German markets are still, however, not so numerous as could be wished. At Paris, Silesian delivered at Havre has made 20*l.* 16*s.* per ton; and other good marks, delivered at Havre or Paris, 20*l.* 12*s.* per ton. At Marseilles, Silesian zinc has made 24*l.*, and rolled 28*l.* per ton, with a discount of 3 per cent. Lead has been neglected; nevertheless, prices are tolerably well sustained. At Paris, French lead, delivered at Paris, has made 19*l.* per ton; Spanish, delivered at Havre, 18*l.* 8*s.* per ton; and English, delivered at Havre, 18*l.* 8*s.* per ton. At Rotterdam, Stolberg has brought 11 fls., and miscellaneous German marks 10¾ fls.

FOREIGN MINES.

DON PEDRO NORTH DEL REY (Gold).—Telegram from Lisbon:—Produce for October, 12,569 oits.; weighed to November 18, 2517 oits.

ECLIPSE (Gold).—The directors have received from the mines through their agents, Messrs. Balfour, Guthrie, and Co., one bar of gold, No. 7413, value $2216=450*l.*

PACIFIC.—H. Prideaux, Nov. 13: Since my last report (Nov. 6) we have raised about 25 tons of ore; the value per ton of this ore is much the same as has been given in my previous report. The quantity of ore sent from the mine to the Mattacom Mill since Nov. 6 is 7 tons 5 cwts. 58 lbs.; the estimated value of this ore is 4 tons 9 cwts. 55 lbs., at $500 per ton—2 tons 16 cwts. 3 lbs., $90 per ton. We have yet at the mine near 130 tons of ore, which is ready to be hauled to the mill. There is no change of importance in any of the stopes, winzes, or drifts, and the mine is at present working well. We are not now short of miners, but have a full force. The mill is running on the company's ore, and so far is giving every satisfaction.—Telegram from Capt. H. Prideaux: "Estimate weekly returns of bullion at $3500. Monthly costs reduced."

— Capt. H. Prideaux, Nov. 20: During the past week we have raised from the mine 20 tons of ore, and sent to the mill 2 tons; value of ore sent to the mill $250 per ton. There is yet at the mine 150 tons of ore waiting carriage to the mill, also 15 tons of unassorted ore. The ledge in the different stopes is from 6 to 24 in. in width, and yielding ore of a fair quality. We shall commence in a day or two to drive a level, which will intersect the Buel North Star ledge 180 ft. below our present workings. The distance to be driven to intersect this ledge is 65 ft., and we shall look forward with interest to the cutting of it.

SIERRA BUTTES (Gold).—The result of the clean up for the month of November is as follows:—Receipts, $30,805; 2330 tons of ore were crushed during the month. Cost of mining and milling the same, at $9·48½ per ton—$13,877. The cablegram (dated San Francisco, Dec. 8) stated that the supply of water stopped one week, but that it is now more plentiful, there having been plenty of snow lately.

CHONTALES (Gold).—J. Tonkin, W. Evans, Nov. 4: San Antonio Mine: The stope in back of No. 5 level has been stoped 65 varas on the north lode, which is 2 ft. wide, worth 6 dwts. of gold per ton. A stope in back of connection level has been stoped 47 varas; lode 2 ft. wide, worth 5 dwts. of gold per ton. A stope in back of levels east and west of the eastern cross-cut has been stoped 66 varas; lode 4 ft. wide, worth 5 dwts. of gold per ton. We have sunk a new boundary shaft on the course of the lode 17 varas, which varies from 2 to 4 ft. wide; on the top part of the shaft the lode was worth about 6 dwts. of gold per ton, but for the last 10 varas showing a little gold, but not to value.—San Sebastian Mine: We have driven east on the course of the lode 27 varas on a lode 4 ft. wide, for the first 15 varas worth from 6 to 8 dwts. of gold per ton, but since much decreased in value; but we are daily expecting an improvement. We have commenced a new tramway from the mine to the stamps, which we shall push on as fast as native labour will permit.—East San Benito Mine: The No. 3 level has been driven east 11½ varas, on a lode small and poor. The No. 2 level has been driven east 11 varas; lode 7 ft. wide, worth 5 dwts. of gold per ton. Rodriquez's rise is communicated with No. 1 level; the lode for the last 11 varas was about 7 ft. wide, and worth 10 dwts. of gold per ton. The stope in back of No. 2 level, east of Moralez's rise, has been stoped 16 varas on the north part of the lode, carrying about 8 ft. of it, which is worth about 1½ oz. of gold per ton. The stope in back of No. 2 level, east of Rodriquez's rise, has been stoped 18¼ varas on the north part of the lode, which is about 6 ft. wide, worth 8 dwts. of gold per ton. The rise in the back of No. 2 level west has been risen 19¼ varas; lode 6 ft. wide, worth 4 dwts. of gold per ton. The No. 1 level has been driven east 12½ varas; lode 6 ft. wide, worth 5 dwts. of gold per ton. The stope in back of this level has been stoped 39 varas; lode worth 5 dwts. of gold per ton.—Santo Domingo Mine: The deep level has been driven 3 varas on a lode 3 ft. wide, worth 3 dwts. of gold per ton. Our returns are now chiefly dependent upon East San Benito Mine, as the stopes in back of No. 5 level at San Antonio are almost exhausted, and the eastern part has not yet turned out so profitably as we anticipated. The former mine has also much improved during the past week, and we fully expect good results in the coming month. The number of tons sent to stamps is as follows: From San Antonio, 486 tons, yielding 4¾ dwts. of gold per ton; from San Benito, 791 tons, yielding 7⅛ dwts. of gold per ton: in all, 1277 tons, equal to 40 "300 ozs. melted gold.

Nov. 6.—Gold returned for October 402 ozs. from 1277 tons of ore; average produce 6⅛ dwts. per ton; value 1112*l.*; cost for the month, including all charges, 1356*l.*—San Antonio Mine: The stopes in the mine have turned out on an average 4¾ dwts. per ton.—San Benito East: The No. 3 level is driving east on a lode small and poor. No. 2 level is driving east on a lode 7 ft. wide, worth 5 dwts. per ton. The rise from No. 2 level has been communicated with the No. 1 level, and for the last 11 varas was worth 10 dwts. per ton. The stopes in the back of No. 2 level are worth 1½ oz. per ton. Another stope in the back of this level is worth 8 dwts. per ton. A rise in the back of No. 2 level west is worth 9 dwts. per ton. In No. 1 level driving east the lode is 6 ft. wide, worth 5 dwts. per ton. A stope in the back of this level is worth 5 dwts. per ton. The health of the establishment continues good.

FLAGSTAFF (Silver).—The directors have appointed Mr. N. M. Maxwell to inspect and report upon the mine and smelting works proposed to be purchased by this company. He will sail from Liverpool on Saturday, and his report may be expected early in January.

BRAGANZA (Gold).—The directors have received the following intelligence, dated Morro de Tabac, Nov. 16:—"The mining operations have been on a much limited scale than usual since the beginning of the month, on account of the absence of some of our best mining hands, who, according to custom at this season of the year, have been occupied in planting their plots of ground for corn crops. There is little or no change in the appearance of the stone. We have had some heavy showers since my last, which have increased the streams considerably, and enable us to work six heads of stamps at the rate of 36 strokes per minute. The men are returning to their work. The Intermediate level is showing very little alteration since my last.

SATURN (Silver).—The directors have received a report from their agent at Salt Lake City, intimating that mining operations are being pushed forward with celerity, and that the prospects of the undertaking are favourable.

MENZENBERG (near Honnef, on the Rhine, Germany).—Dec. 14: The agents report that in the cross-cut from Joseph shaft there is nothing new to report. From the appearance of the cross-cuts were not deep enough, as one of the lodes rises only about 18 in. from the bottom of the level. On the lode recently discovered in the eastern cross-cut, which, including the flookan, is 9 ft. wide, we are now driving; everything about this lode indicates lead. In Munchberg adit the lode has improved. In the (Dickens) shaft behind the Menzenberg Hotel the lode will produce 15 tons of ore to the fathom for the size of the trial shaft (9 ft. by 4); one-half of this ore will produce about 5 per cent., and the other half 12 to 15 per cent. The value of the lode may be estimated at 90*l.* to 100*l.* per fathom. There are certainly over 50 tons of ore at surface. The woodwork of the house over the shaft is completed, and a temporary protection is thus afforded to the men from the extreme cold. There is no indication of a wall to the lode, neither the run, the size, nor the underlie of this splendid lode are as yet ascertained. The shaft is 3 lachters 3 feet deep—a lachter is 6 ft. 10½ in. English measure.

FORTUNA.—Dec. 6: Canada Incosa: The lode in the 110 fm. level, west of Henty's shaft, is large and open, and letting down water freely. The lode in the 100, west of Henty's shaft, is small and compact, yielding ¾ ton of ore per fathom. The lode in the 80, south of Henty's shaft, is small and poor. The 60, east of San Pedro's, is holed to Cayetano's winze, east of which it will be driven as soon as the level is made good; producing 1 ton of ore per fathom. The lode in the 90, east of Addis's, has fallen off in value during the past fortnight. The lode in the 80, west of Lowndes', has improved, and is of a kindly appearagee, yielding 1 ton of ore per fathom. The 80, east of Lowndes', is in a strong cross-course, which has disarranged the lode.—Shafts and Winzes: The men are driving a cross-cut under Judd's shaft, below the 90 fm. level, in the 100 fm. level, with a view to let down the water. In Lowndes' shaft, below the 80, the men are now cutting cistern-plat; this done, sinking towards the 90 fm. level will be resumed. Serrano's winze, below the 70, is going down in a very good lode, yielding 2 tons of ore per fathom.—Los Salidos: The lode in the 110, west of Buenos Amigos engine-shaft, is small and less productive than it was, yielding ½ ton of ore per fathom. The lode in the 100, west of Buenos Amigos, is disarranged, and of little value at present—worth ½ ton per fathom. The 90 fm. level, west of San Carlos, is not opening ore ground of any value. In the 75, west of San Carlos, the lode continues small, producing ¼ ton of ore per fm. The lode in the 110, east of Buenos Amigos shaft, has diminished a little both in size and value during the past week, yielding ½ ton of ore per fathom. The lode in the 110, east of Morris's, is small, and the ground very hard for driving. The lode in the 100, east of Cox's, is not so productive as it was a few days since, yielding 1½ ton of ore per fathom. In the 90, east of San Miguel, the lode has greatly improved, and a valuable piece of ore ground is being opened, worth 3 tons per fathom. The 25 fm. level, west of Palgrave's, is still in old works. In the 35, north of Palgrave's, several small branches have been met with, but they are of no value.—Shafts and Winzes: From San Carlos shaft, below the 90, we expect to get through to the 100 fm. level in the present month; producing 1½ ton of ore per fathom.—San Pablo's shaft, below the 90, is down to the 100 fathom level, yielding 2½ tons of ore per fathom. The lode in Jordan's winze, below the 100, is small and irregular, yielding ½ ton of ore per fathom. In Augustin's winze, below the 100, the lode continues very small, and the granite hard for sinking through, yielding ½ ton of ore per fathom. A very good rate of raisings was maintained during the past month, and the stopes have not undergone any change of importance. The works at surface are going on very regularly, and the machinery is in good working condition. We esthmate the returns for December (five weeks) at 450 tons.

LUSITANIAN.—Dec. 5: Palhal: In Taylor's engine-shaft, sinking below the 150, the lode is worth 2 tons per fathom.—Levels on Basto's Lode: The 150, east of Taylor's shaft, contains a lode 4 ft. wide, composed of quartz and runners of country; and the same level west a lode worth 2 tons per fathom. In the 140 east the lode is 5 ft. wide, unproductive; and in the 140 west the lode yields 1¼ ton per fathom. In the 130 east the lode is 6 ft. wide, composed of quartz. In the 120, east of River's shaft, the lode is 8 ft. wide, yielding stones of ore. The lode in the 110 east is 4 ft. wide, made up of schisto and quartz; and in the 90 east 3 ft. wide, containing stones of ore. The 70 east, in which the lode was 8 ft. wide, spotted with lead, is suspended, and the men put to sink a winze in the bottom of the level. In the adit, west of Perez' shaft, the lode is 6 in. wide, and contains a branch yielding rich stones of ore. Mill lode, in the 38, east of Taylor's, is 1 ft. wide, composed of schisto and flookan. The branch in the 38, west of the slide lode, is still in a disordered state, and of no value. The slide lode, in the 130, west of Taylor's, is 1 ft. wide, composed of flookan.—Rises and Winzes on Basto's Lode: The rise above the 90, east of River's shaft, is going up on a lode 3½ ft. wide, worth 1 ton per fathom. In No. 89 winze, below the 70, east of River's shaft, the lode is 2 ft. wide, giving stones of ore. In No. 90, below the 140, west of Taylor's, the lode produces 2 tons per fathom. We have completed the plat at the 110 at River's shaft.—Carvalhal: The ground is without alteration in the 60 cross-cut north of incline shaft.—Great Lode: In the 60, east of incline shaft, the lode is 1 ft. wide, poor; the same remark applies to the lode in the 50, which is 1½ ft. wide. In the 40 it is 1 ft. wide, spotted with lead; and in the 30 east 3½ ft. wide, worth ½ ton per fathom. In the 20 east the lode is composed of strings of quartz and country.—Caunter Lode: In the adit, west of incline shaft, the lode is very small and unproductive. In the 10 west the lode is rather poor, and the men are now rising above this level, where the lode is 4 ft. wide, composed of quartz and mundic, and yielding of lead and blende ½ ton per fathom. In the 20 west the lode is 3 ft. wide, composed of quartz; and in the 30 west 1 ft. wide, yielding a little mundic.

LINARES.—Dec. 6: Pozo Ancho Mine: The branch of lead in the 85, west of Crosby's shaft, is small at present, yielding ½ ton per fathom. The lode in the 75, west of Crosby's, yields occasional stones of ore, but not sufficient to value. The lode in the 75, east of San Francisco, is looking a little better than it was, producing ½ ton of ore per fathom. The lode in the 75, west of San Francisco, is very regular, and of a promising appearance, producing 1 ton of ore per fathom. In the 65, west of San Francisco, the lode is poor, and the granite very hard for driving. The lode in the 55, west of San Francisco, is small, compact, and very regular, yielding ½ ton per fm. There is no improvement in the 45, east of San Francisco, to notice. The stopes yielded very well in the past month, and are now without any alteration worthy of notice. The surface works are going on very regularly, and the machinery is in good working order. We estimate the raisings for December, five weeks, at 250 tons.—Quintentos Mine: In the 65, west of Taylor's engine-shaft, the ground is very hard for driving, and the lode small and poor. In the 55, west of Taylor's engine-shaft, the lode is smaller and less productive than it was, yielding 1 ton of ore per fathom. The lode in the 65, east of Taylor's engine-shaft, continues unproductive. In the 55, east of Taylor's engine-shaft, the lode is large, and contains stones of ore, but not enough to value. The 45, east of Addis's, is also a large and strong lode, yielding ¾ ton per fathom. The 32, east of Henty's, is opening a piece of ore ground of great value, yielding 3 tons per fathom. We expect to hole the 32, west of San Carlos, to the last-named end in the present month—yielding 2 tons of ore per fathom. The lode in the 45, west of San Carlos, has failed in the driving during the past week. In the 55, west of San Carlos, the lode is large and strong, but not of any value at present. In the 55, east of San Carlos, the lode is open, easy for driving, and of a promising appearance, yielding 1 ton of ore per fathom. There is a rich lode in Esteban's winze, a little in advance of the 45, east of San Carlos shaft, worth ½ ton of ore per fathom. In the 32, east of Judd's, the lode contains good spots of lead.—Shafts and Winzes: In Carmona's winze, below the 55, the lode is large, and very coarse. In Salvador's, below the 32, the lode is small, producing very good stones of ore, yielding ½ ton per fm. Esteban's winze, below the 32, is deep enough for the 45, and will be holed by the end reaching it this month; producing 4 tons of ore per fathom. In Perez' winze, below the 32, the lode has failed greatly, and now only produces occasional stones of ore.

ALAMILLOS.—Dec. 6: The 60 fathom level, west of San Rafael's shaft, is being driven through a hard bar of ground. The lode in the 60, east of San Francisco's, is small and regular, yielding ½ ton of ore per fathom. In the 60, west of San Francisco's, the lode is small and poor. In the 50, east of La Magdalena, the ground is very hard for driving, and the lode small and poor. The lode in the 75, east of Taylor's engine shaft, is large and strong, consisting chiefly of carbonate of lime. In the 85, east of Taylor's engine-shaft, the lode is very wide, and contains good stones of ore, yielding 1 ton of ore per fm. In the 50, west of San Adriano's cross-cut, the lode is small and poor. There is no improvement in the 50, west of San Yago's shaft. The main slide is in the middle of the 40, east of San Victor's, and in the upper part the lode is of a very promising appearance. In the 40, west of San Victor's cross-cut, the lode is strong, and of a kindly appearance, yielding ¾ ton of ore per fathom. The 50, south of San Victor's shaft, is in very hard granite. The water is spouting out with great force from the lode in the 20, east of Addis' shaft. The 40, east of Crosby's, is opening a very valuable piece of lode, yielding 2 tons of ore per fm. There is no improvement in the 50, east of Crosby's. In the 50, east of Crosby's cross-cut, the lode is small and compact, producing ½ ton of ore per fathom. In the 50, west of Crosby's cross-cut, the lode is very changeable, and has failed during the past few days, producing ore worth 1 ton per fm. The 40, west of Crosby's cross-cut, continues to open very good tribute ground, yielding 1½ ton of ore per fathom.—Shafts and Winzes: Very good progress was made in Cox's shaft, below the 40 fm. level, in the past month. Jaen's winze below the 40, is down to the 50 fm. level, yielding ½ ton of ore per fathom. Alejandro's winze, below the 30, is going down in a rich shoot of ore, worth 5 tons per fathom. In Sebastian's winze below the 40, the lode is compact and regular, yielding 1¼ ton per fathom. The lode is again improving in Rica's winze below the 30, yielding 2½ tons per fathom. The lode in Felipe's winze below the 30, is not nearly so productive as it was, yielding 2½ tons per fathom. The tribute department yielded very well in the past month, and the stopes are now without any change requiring remark. The surface work is going on regularly, and the machinery is in very good condicion. We estimate the raisings for December at 225 tons.

[For remainder of Foreign Mines see to day's Journal.]

PUMPING MACHINERY AT MONTCEAN-LES-MINES.—At the St. Mary pits, belonging to the Blanzy Mining Company, Mr. H. Audemar, the chief engineer, has replaced the series of short lifts previously employed by a single lift of 375 yards. The engine is placed 300 metres below, being just above the immersible portions of the works, and pumps from 40 metres below. Great care has been taken to ensure every portion of the apparatus being thoroughly substantial and reliable.

RICH DISCOVERIES IN RUSSIA.—Golden intelligence reaches St. Petersburg from the Central Asiatic Province of Semipalatinsk. Copper mines with more than 60 per cent. of pure metal have been discovered. Silver mines yielding 1-7th of pure ore, lead mines containing ¾ of the real stuff, and coal fields whose product gives from 60 to 90 per cent. of coke, are likewise included in the treasure trove. The immediate consequence of the discovery will be to send some thousands of Russians to the spot.

THE IRON AND STEEL INSTITUTE.—The November number of the Journal of this Institute contains report of the proceedings at the Dudley meeting, and the papers on the Geological Features of the South Staffordshire Coal Field, by Henry Johnson; Description of the Ayresome Ironworks, Middlesborough, with remarks upon the gradual increase in size of the Cleveland Blast Furnaces, by John Gjers; Further Results from the Use of Hot-blast Fire-brick Stoves, by Thomas Whitwell; On Increasing the Height of Blast-Furnaces in the Midland District, by T. W. Plum; On Ferrie's Covered Self-coking Furnace, by I. Lowthian Bell; On the Composition of the Gases evolved from the Bessemer Converter during the Blow, by G. J. Snelus, with a description of his revolving puddling furnace (with several illustrations); and on Chemical Phenomena of Iron Smelting, by I. Lowthian Bell; as well as the quarterly report by the Foreign Secretary, and Notes on the British Iron and Steel Trades by the Editor. There is a valuable notice of Mr. Huck's process of utilising blast-furnace slag. One part of the slag in fine powder is stirred about in a suitable tank or reservoir, with two parts of a mixture of equal parts of hydrochloric acid (containing 35 per cent. of hydrochloric acid) and water. The slag decomposes readily, emitting strong fumes of sulphuretted hydrogen gas; and the mass becoming thicker by gradual stages, until, when the chemical action is terminated, it presents itself in the form of a thick jelly, from which the chlorides formed by the hydrochloric acid on the bases can easily be washed out with water, and drained off from the more solid gelatinous mass remaining behind, which is then dried and ground to an impalpable powder. One part of this powder, when intimately mixed with nine parts of finely-powdered slag will, it is affirmed, afford a cement which can be employed for all work, as well under as above water, and which, as regards density and hardness, is considered equal to the best cements in ordinary use.

POST OFFICE LONDON DIRECTORY.—The appearance of the new edition, the seventy-third, of the Post Office London Directory reminds us that another year is fast closing upon us; yet this indispensable volume still retains its vigour, and affords abundant proof that quite as much care has been bestowed upon its production for the coming year as it received when it had still a reputation to earn. The impracticability of reading a volume of 2700 pages previous to reviewing it has already been pointed out, yet it is not difficult to test the general accuracy of such a work as a Directory by referring to individual cases, and amongst the recent corrections we find that the death of Sir Roderick Murchison is duly noticed by the removal of his name from five of the Directory where it would otherwise have appeared. Lord Blachford (formerly Sir Frederic Rogers) is properly inserted under his new title in the five places in the Directory; Mr. W. Law, C.B., is inserted as such; Sir Robert Christison appears as a baronet and member of the Medical Council, Mr. Sheriff Truscott as alderman of Dowgate, and Mr. Edward Bates as M.P. for Plymouth. The appointment of Sir R. P. Collier as judge of the Judicial Committee is duly noticed, whilst Sir John Coleridge and Mr. Jessel, Q.C., the new Attorney-General and Solicitor-General, are so described. The deaths of Master Park, of the Court of Common Pleas; and of Mr. Markham, the late Consul at Shanghai, are duly noticed by the removal of their names; and the appointment of Mr. H. de Jersey as Secondary of London, and of Mr. Hugh Mallet as Consul at Carthagena are properly recorded. These alterations prove that the revisions have been carried up to Dec. 2, although the work is published within a week of that date. More in praise of the volume we cannot say than that it is in every respect equal to former editions.

MOMENTS OF PLEASURE.—Under this title an interesting little volume of 25 poems, by Mr. Samuel H. Beckles, F.R.S., F.G.S., &c. (London: Harrison, Queen's Terrace, St. John's Wood), has just been issued, and may be commended to the readers of the Journal because the theme of many of them is that with which they are directly connected. The poem "Design in Creation" (which is supplemented by A Flower; Insects—the Glowworm; Birds—the Humming-bird; the Earth—Geology; and the Heavens—Astronomy) will be very generally admired, as will also those on Perpetuation of Genera, to a Scientific Friend, and on the Ape. The volume is enriched by a series of useful notes, containing an abundance of information, which greatly enhance its value.

COPPER ORES.

Sampled Nov. 22, and sold at Tabb's Hotel, Redruth, Dec. 7.

Mines.	Tons.	Price.	Mines.	Tons.	Price.
West Wheal Tolgus	95	£5 8 6	Crenver & Abraham	56	£3 7 6
ditto	85	5 6 6	ditto	47	5 7 6
ditto	82	5 6 6	ditto	35	6 9 0
ditto	70	5 8 6	ditto	11	3 4 0
ditto	66	5 0 6	South Crofty	64	3 5 0
ditto	56	3 17 0	ditto	53	2 14 0
ditto	31	2 3 6	ditto	34	2 5 0
West Wheal Seton	58	7 12 0	ditto	17	3 16 0
ditto	50	5 9 6	ditto	11	11 15 6
ditto	46	3 0 6	East Pool	84	3 10 6
ditto	45	10 2 0	ditto	22	3 19 6
ditto	29	2 17 6	Wheal Basset	42	4 6 0
ditto	22	3 12 0	ditto	31	3 11 0
Wheal Seton	30	5 8 6	ditto	15	6 3 0
Pendarves	57	6 9 0	Levant	20	9 19 6
ditto	52	6 2 6	North Downs	13	5 13 0
ditto	43	4 13 0	North Roskear	10	7 6 6
ditto	36	1 6 6	South Dolcoath	9	3 8 6
Crenver & Abraham	69	4 13 6	Tolcarne	6	2 4 0

TOTAL PRODUCE.

West Tolgus	485	£2399 1 6	Wheal Basset	88	£ 382 18 0
West Seton	250	1470 15 6	Levant	20	199 10 0
Wheal Seton, &c.	218	1095 11 0	North Downs	13	73 9 0
Crenver and Abra.	218	1025 3 0	North Roskear	10	73 5 0
South Crofty	179	621 14 6	South Dolcoath	9	30 16 6
East Pool	106	383 11 0	Tolcarne	6	13 4 0

Average standard ..... £110 16 0 | Average produce 6⅞
Average price per ton £4 17 0
Quantity of ore ..... 1602 tons | Quantity of fine copper .. 109 tons 18 cwts.
Amount of money £7769 19 0

LAST SALE.—Average standard ..... £105 18 0—Average produce 6½
Standard of corresponding sale last month, £102 9 0—Produce, 6¼.

COMPANIES BY WHOM THE ORES WERE PURCHASED.

Names.	Tons.	Amount.
Vivian and Sons	248	£1212 15 6
Grenfell and Sons	217	1183 19 0
Sims, Willyams, and Co.	134½	1125 12 0
Williams, Foster, and Co.	282	1262 16 0
Mason and Elkington	374½	1503 1 0
Charles Lambert	94	439 9 0
Sweetland, Tuttle, and Co.	252	1047 6 6
Total	1602	£7769 19 0

NO SALE on Thursday last, December 14.

Copper Ores for sale at the Royal Hotel, Truro, on Thursday next—Mines and Parcels.—Devon Great Consols 1307—Marke Valley 461—South Caradon 452—Gawton Copper Mine 388—Glasgow Caradon 360—Hingston Down 252—Bedford United 208—East Caradon 196—Wheal Russell 188—Phœnix Mines 161—Prince of Wales 125—Gunnislake (Clitters) 115—Gonamena 87—Craddock Moor 70—Bolstone 10—Franco Consols 10.—Total, 4289 tons.

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H. R. Marsden, Esq. THOS. GOLDSWORTHY & SONS.

Alka'i Works, near Wednesbury.—I at first thought the outlay too much for so simple an article, but now think it money well spent. WILLIAM HUNT.

Welsh Gold Mining Company, Dolgelly.—The stone breaker does its work admirably, crushing the hardest stone and quartz. WM. DANIEL.

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Stone and Lime Merchants, Darlington.

Kirkless Hall, near Wigan.—Each of my machines breaks from 100 to 120 tons of limestone or ore per day (10 hours), at a saving of 4d. per ton.
JOHN LANCASTER.

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General Frémont's Mines, California.—The 15 by 7 in. machine effects a saving of the labour of about 30 men, or $75 per day. The high estimation in which we hold your invention is shown by the fact that Mr. Park has just ordered a third machine for this estate. SILAS WILLIAMS.

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H. R. Marsden, Esq. Weston, near Runcorn

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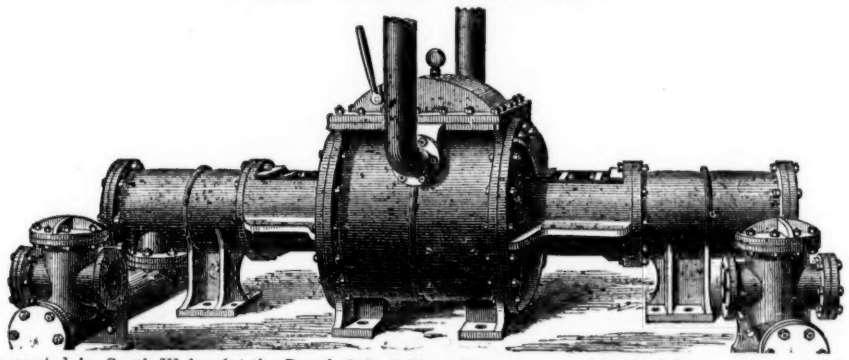

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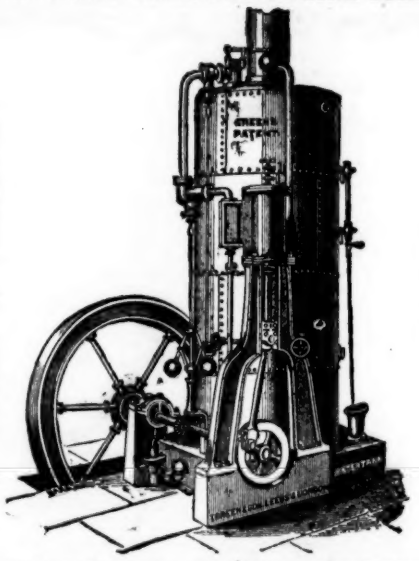

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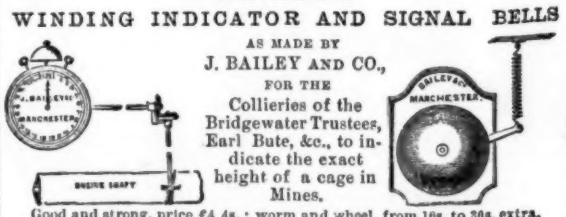

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